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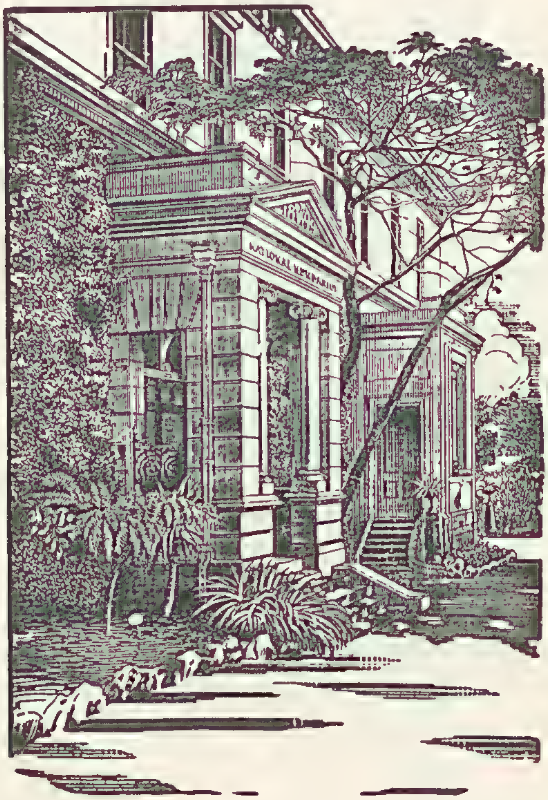

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ERRATA

Contributions from the New South Wales National Herbarium

Vol. 4. No. 5

page 250, line 5, *Briachiaria* should read *Brachiaria*

page 250, lines 11, 19, 20 and 28, Murbuk should read Murbeck

page 276, line 40, and page 277, legend of map, *A. huntiana* should read *A. huntianus*

page 277, line 11, *Arthrochilus huntiana* should read *Arthrochilus huntianus*

The *Xyris gracilis* Complex

O. D. EVANS

SUMMARY

Two subspecies are distinguished in *Xyris gracilis* R. Br. In New South Wales, subspecies *gracilis* occurs in the Coast District from north to south and extends in places to the Tablelands; it is found also in Victoria. Subspecies *laxa* O. Evans ssp. nov., in apparently pure populations, is found only in a portion of the Coast District extending from the vicinity of Port Jackson southward to Jervis Bay; it co-exists in places with ssp. *gracilis*. Intermediate forms are known from a considerable range north and west of Port Jackson and their variation and occurrence are discussed. In Tasmania *X. gracilis* is replaced by a closely allied unnamed species, the characters of which are discussed together with less closely related species which have been confused with *X. gracilis*.

In dealing with the genus *Xyris* for the Flora of New South Wales, investigation of material referred to *X. gracilis* R. Br. has shown that, in the Central Coast and the northern part of the South Coast District, two taxa are readily distinguishable over a considerable area but in other areas are merged into a range of intermediate forms. Robert Brown recognised two principal forms as species, which he described as *X. gracilis* and *X. bracteata*, but later authors, excepting Kunth (1843), Rendle (1899) and Malme (1927), did not uphold the latter. Some confusion has also arisen because of Bentham's misplacement of *X. bracteata* R. Br. as a variety of *X. operculata* Labill. At the same time he described a plant from Tasmania (now *X. muelleri* Malme) as *X. gracilis* R. Br. var. *bracteata* Benth.

The present study has shown that plants corresponding to the description of *X. bracteata* R. Br. are present in considerable numbers in the coastal area extending from Botany Bay and the Royal National Park southward to the nearer coastal highlands as far as the Bulli district, and re-appear on the coast at Jervis Bay. Normal *X. gracilis* R. Br. *sensu stricto*, in smaller numbers, also grows in these areas but no evidence of intergrading has so far been found there, although plants of the two forms may be found growing close by each other. On the other hand, in the areas between Port Jackson and Broken Bay and near Linden on the lower Blue Mountains, the populations are almost entirely intermediate and variable in character, though some individuals may approximate to the end-forms. Some collections from the King's Tableland, from the upper Macdonald River near Howe's Valley and from the North Coast are also intermediate.

Fig. 1 shows some of the more useful discriminatory characters in specimens of samples drawn from the whole of the New South Wales portion of the geographic range. It will be noted that in this diagram no single character shows a break in variation between the end-forms and those designated as intermediate; nevertheless the two end-forms show greater correlation of characters than do the intermediate plants, in which a wider scatter is evident. This is not the whole picture, however, as can be seen from the distribution pattern as shown in Fig. 2. In the region south of Botany Bay the individuals examined all fall into one or other of the two terminal clusters as shown in Fig. 1, and if this area alone were taken into account the two groups could be considered as a pair of sympatric species. On the other hand, in view of the very extensive intergrading elsewhere it seemed best to recognise only a single species consisting of two subspecies, although these do not show a clear geographic replacement pattern. The subspecies may be recognised where applicable, but where this would not result in a workable classification the species may be taken as a whole. The nature of the apparently effective barrier in the southern region and the reason for its absence elsewhere are at present obscure. There is no difference in chromosome numbers (Briggs, 1965) or flowering period.

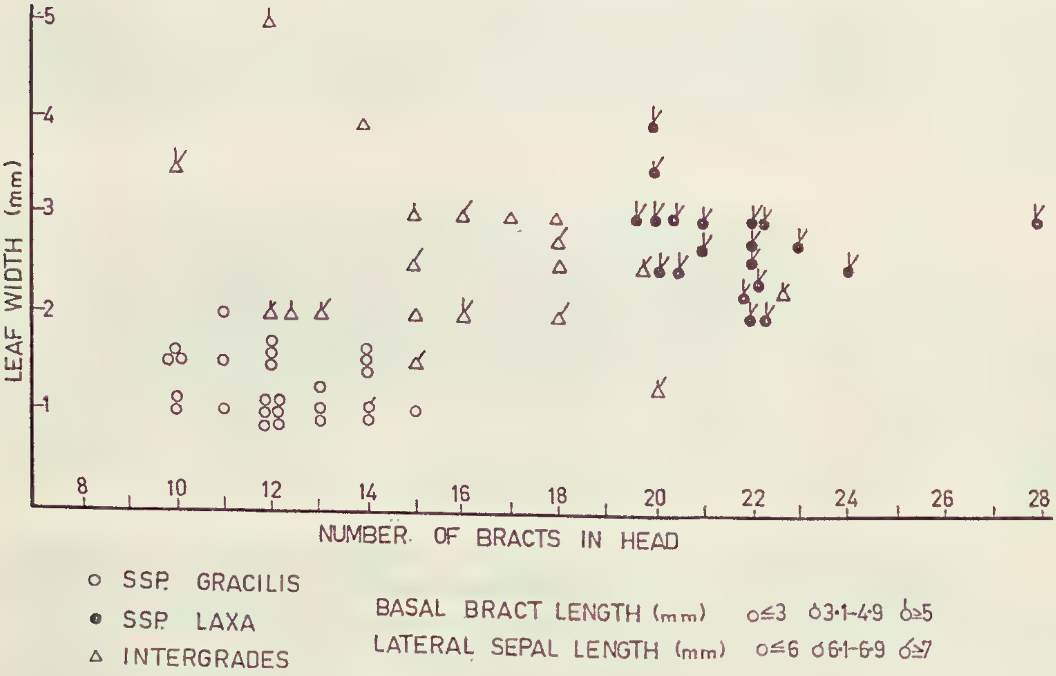

Fig. 1.—Variation in *X. gracilis.* For explanation see text.

Ecologically there is some difference in range of the subspecies but considerable overlap as mentioned below (p. 6). Furthermore there is little evident difference in the available conditions in the various parts of the geographic range.

Because of the complex variation and the confusion concerning the epithet "*bracteata*", the subspecies is described as new with a new Type, of which the exact locality and the chromosome number are known. *X. bracteata* is treated as a synonym but not the basionym of the new trinomial.

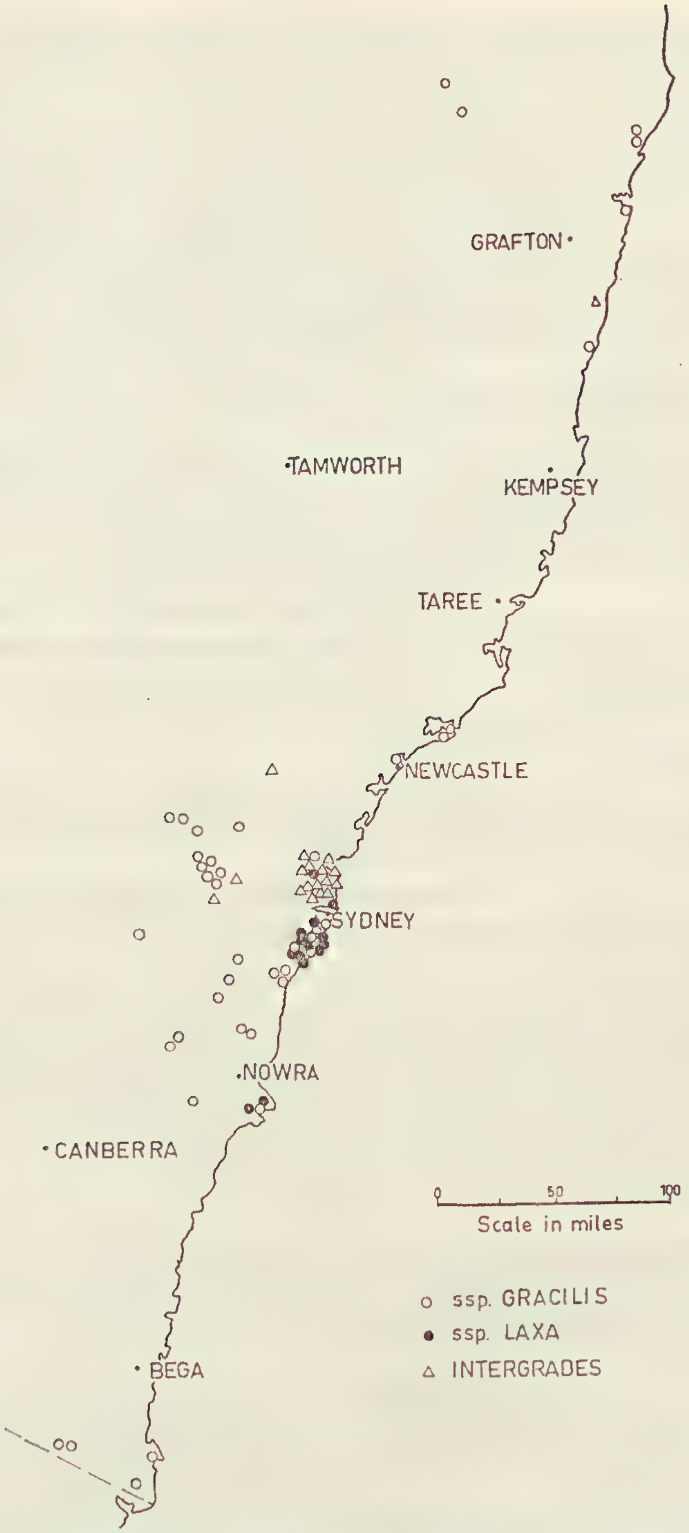

Fig. 2.—Distribution of *X. gracilis* in New South Wales. In addition to the localities shown, ssp. *gracilis* extends southward into Victoria.

Xyris gracilis *R. Br.*, Prodr. Fl. Nov. Holl. (1810) 256; Kunth, Enum. Pl. IV (1843) 21; Hook. f., Fl. Tasman. II (1857) 69, excluding Tasmanian specimens; F. Muell., Fragm. Phytogr. Austral. VIII (1874) 204; Benth., Fl. Austral. VII (1878) 79, excl. var. *bracteata*; Nilss. in K. Svensk Vet.-Akad. Handl. n.s. XXIV, No. 14 (1891) 26, excl. var. *bracteata*†; Moore & Betche, Handb. Fl. N.S.W. (1893) 437; Rodway, Tas. Fl. (1903) 220, excl. Tasmanian material; Maiden & Betche, Census N.S.W. Pl. (1916) 38, excl. var. *bracteata;* Arber in Bot. Gaz. LXXIV (1922) 83, pl. II, fig. 17; Malme in Svensk Bot. Tidskr. XXI (1927) 381-399; Williamson in Vict. Nat. XLV (1928) 160, excl. fig.; Ewart, Fl. Vict. (1931) 262; J.H. Willis, Handb. Pl. Vict. (1962) 280; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Distr. (1963) 432. Further references will be found under the synonymy of ssp. *laxa*.

A complete specific description will be published in Contrib. N.S.W. Nat. Herb., Flora of New South Wales, No. 27.

1. Leaves narrow-linear, not exceeding 2 mm. wide. Flower-heads ovoid to ellipsoid; bracts 6-14, all closely appressed, the two at the base of the head not exceeding 3 mm. long. Flowers 1–4 in the head .... ssp. *gracilis* a.

1.* Leaves linear, 2–5 mm. wide. Flower heads subglobose; bracts 18–28, the two at the base 3–13 mm. long, lax. Flowers mostly 8–12 in the head .... ssp. *laxa* b.

The above key applies to typical representatives of the two subspecies; as pointed out above, intermediate plants will often be found showing different associations of characters.

a. ssp. **gracilis.**

Typification: Brown's syntypes were from Victoria and Tasmania. They have not been examined but plants from Victoria correspond with the present application of the name whereas Tasmanian plants so far as is known do not (see below).

The type subspecies is characterised by the comparatively narrow flower heads with closely imbricate bracts and fewer flowers, together with uniformly very narrow leaves.

Leaves narrow-linear, 1–1.5 (–2) mm. wide, erect, rigid, often twisted. Peduncles terete, up to 60 cm. long, 0.5–1 mm. diam. Flower-heads ovoid to ellipsoid, 6–8 mm. long, 3–5 mm. wide; basal bracts closely appressed, the lowest pair 2–3 mm. long, the total number of bracts 6–14. Flowers 1–4 in the head. Lateral sepals not exceeding 6 mm. long, straight or slightly curved, the membranous wings each ca. 0.5 mm. wide. Anthers 1.5–2 mm. long. Seeds ca. 1 mm. long. Chromosome number $2n = 26$. Fl. summer.

Distribution: Coast and Tablelands of New South Wales, eastern and southern Victoria, in sedge swamps on sandstone and similar rocks and in deep sandy soils near the margins of coastal swamps. The following specimens are considered typical of ssp. *gracilis*.

New South Wales: *Northern Tablelands:* Boonoo Boonoo, via Tenterfield, Knoetzsch 1.1885 (MEL); Timbarra, Stuart (?) (MEL). *North Coast:* Wardell, Constable 10.1961 (NSW 63267), 5.1964 (NSW 65116); S of Broadwater, Constable 5.1964 (NSW 64570); 1 mile W of Angourie, Green & Williams 11.1962 (NE); Coff's Harbour Airport, Green & Williams 10.1962 (NE); Coff's Harbour Airport, Constable 5.1964 (NSW 69451); Hastings R., Beckler (MEL); 2 miles SW of Lemon Tree Passage, Port Stephens, Johnson 4.1964 (NSW 69230); S of Nelson

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† Nilsson cited a Port Jackson specimen under *X. gracilis* var. *bracteata* Benth. This presumably does not belong to that taxon, which is a Tasmanian plant (see p. 7), but I have not seen the specimen. The same applies to the specimen from Port Jackson cited by Rendle in Journ. Bot. XXXVII (1899) 501.

Bay on Stockton road, Evans 12.1961 (NSW 63140); Newcastle Racecourse, Cambage No. 608, 11.1901 (NSW 18334; SYD). *Central Coast:* Cowan, Evans 12.1963 (NSW 64314); Peat's road, Hornsby to Hawkesbury R., Deane 12.1884 (NSW 18327); Randwick, Betche 11.1881 (NSW 18335); near Long Bay Gaol, Evans 11.1932 (SYD); near La Perouse, Botany Bay, Evans 12.1925 (SYD), 12.1929 (SYD); S of Waterfall, on Prince's Highway, Evans & Constable 5.1964 (NSW 68719, 69453); junction of Prince's Highway and Darke's Forest road, Constable 2.1964 (NSW 64574); junction of Prince's Highway and Appin road, Constable 7.1963 (NSW 66918); near Bulli Lookout, Evans & Constable 5.1964 (NSW 68718); Thirlmere to Buxton, Evans 12.1962 (NSW 66926). *South Coast:* Bowen Is., Jervis Bay, Rodway 12.1925 (NSW 58324); Green Cape, Rodway 12.1920 (NSW 58326); Mt. Naghi, Naghi State Forest, Constable 8.1963 (NSW 64359). *Central Tablelands:* Clarence, Boorman 1.1901 (NSW 18331); Clarence, Constable 7.1963 (NSW 66134); Newnes Junction to Eskbank, Hamilton 11.1914 (NSW 18336); below Newnes Junction Station, Constable 6.1963 (NSW 66135); Bell, Constable 6.1964 (NSW 64604); near Mt. Irvine, Constable 4.1963 (NSW 63235); Mt. Victoria, Maiden 12.1896 (NSW 18333); Mt. Boyce, Blackheath, Constable 12.1963 (NSW 63142); Blackheath, Evans 1.1928 (SYD); Blackheath, Constable 11.1963 (NSW 66546); Katoomba, Camfield 12.1908 (NSW 18328); Minnehaha Falls, Katoomba, Constable 8.1964 (NSW 65115); The Lake, Wentworth Falls, Constable 1.1964 (NSW 64016); Wentworth Falls, Burgess 1.1956 (NSW 35822); King's Tableland, Wentworth Falls, Hamilton 1.1915 (NSW 18339); Kanangra Walls, Sydney University Biological Soc. 4.1959 (SYD); Hill Top, Picton to Mittagong, Cheel 11.1911 (NSW 18337); Hill Top, Evans 1.1963 (NSW 63141); Mittagong, Dixon (NSW 18338); Upper Kangaroo R., SE of Robertson, Rodway 1.1943 (NSW 58323); Wingello, Boorman 12.1899 (NSW 18332). *Southern Tablelands:* Barber's Creek, Tallong, Rumsey 3.1899 (NSW 18340); Sassafras, Hadley, ex Herb. Rodway No. 3058, 1.1940 (NSW 58325); White Rock R., near Rockton, Constable 8.1963 (N.S.W. 64357); Genoa district, Bäuerlen 2.1885 (MEL).

VICTORIA: Herb. Mueller (MEL); Providence Ponds, Gippsland, Howitt 1882 (MEL); S. Gippsland, Lucas 1.1893 (MEL); Gippsland, Lucas 1.1884 (MEL); Emerald, McLennan 11.1904 (MEL); base of the Dandenong Ranges, Mueller 2.1875 (MEL); Port Phillip, Walter 12.1897 (NSW 18341); near Merton and Mordialloc, Reader (2 sheets) 1.1885, 3.1885 (MEL) (Note: the Merton locality, on the northern side of the Main Divide, seems doubtful).

Willis (1962) records the species also from near Portland and from the Glenelg River, but I have seen no material from western Victoria.

b. ssp. **laxa** *O. Evans* **ssp. nov.**

Folia linearia plana acuminata, 2–5 mm. lata, marginibus scabridulis. Pedunculi teretes vel angulati, 1–2 mm. diametro. Capitula subglobularia, circiter 1 cm. longa, 0.7–0.8 cm. crassa (corollis bracteisque longis exceptis); bracteae 18–28, basilares laxae, scariosae, 2 infimae 4–13 mm. longae, oblongae vel lineares, saepe pallidae et conspicuae. Flores 8–12. Sepala lateralia 6–8 mm. longa, recta vel paulo curvata, ala unaquaque membranea circiter 0.5 mm. lata. Antherae 2–2.5 mm. longae. Semina 1–1.5 mm. longa. Chromosomata somatica $2n = 26$.

HOLOTYPE: 1 mile NW of Marley Beach, Royal National Park, N.S.W., B. G. Briggs 9.12.1961 (NSW 57708).

Leaves linear, flat, acuminate, 2–5 mm. wide, margins scabridulous. Peduncles terete to angular, 1–2 mm. diam. Flower-heads subglobose, ca. 1 cm. long, 0.7–0.8 cm. thick (omitting corollas and long bracts); bracts 18–28, the basal ones lax, scarious, the lowest two 4–13 mm. long, oblong to linear, often pale and conspicuous. Flowers 8–12 in the head. Lateral sepals 6–8 mm. long, straight or slightly curved, the membranous wings each ca. 0.5 mm. wide. Anthers 2–2.5 mm. long. Seeds 1–1.5 mm. long. Chromosome number $2n = 26$. Fl. summer. *X. bracteata* R. Br., Prodr. (1810) 256; Kunth, Enum. Pl. IV (1843) 21; Rendle in Journ. Bot. XXXVII (1899) 503; Malme in Svensk Bot. Tidskr. XXI (1927) 384; *non X. gracilis* R. Br. var. *bracteata* Benth., Fl. Austral. VII (1878) 79. Type of *X. bracteata* from Port Jackson in BM, not seen, but clearly this subspecies from the description; probable Isotype in MEL which agrees with Brown's description and with the present subspecies (B. G. Briggs, pers. comm).

The subspecies is characterised by the larger flowerheads with more numerous bracts and flowers, the lax and often elongated sterile basal bracts and the wider leaves.

Distribution: Central Coast and northern part of the South Coast of New South Wales, in damp soil, commonly in heathland. The following specimens are considered typical of ssp. *laxa*.

New South Wales: Sieber No. 427, Fl. Nov. Holl. (MEL); Brown, Iter Austral. 1802-5, 2 sheets (MEL). *Central Coast:* Mt. Colah, Salasoo No. 1512, 1.1957 (NSW 58322); Manly, Siegert 12.1884 (MEL); Mosman, Chapman 11.1906 (SYD); Kogarah, Camfield 11.1896 (NSW 18343); Kurnell, Constable 12.1962 (NSW 66058); Loftus, Camfield 1896 (NSW 18346); Loftus, Constable 7.1963 (NSW 66920); Loftus, Evans & Constable 5.1964 (NSW 68716); Port Hacking, Hamilton 1.1909 (NSW 18344); Bundeena, Green 11.1960 (NE); 1 mile NW of Marley Beach, Briggs 12.1961 (NSW 57708) HOLOTYPE; near Flat Rock, Royal National Park, Constable 2.1964 (NSW 64568); Waterfall, Camfield 1.1899 (NSW 18342); Prince's Highway, S of Waterfall, Evans & Constable 5.1964 (NSW 64569); Stanwell Park to Otford, Salasoo No. 1282, 12.1954 (NSW 30940); N of Sublime Pt., W of Austinmer, Constable 7.1963 (NSW 66919); Bulli, near junction of Prince's Highway and Appin road, Evans & Constable 5.1964 (NSW 68717). *South Coast:* Currarong, N of Jervis Bay, Briggs 12.1963 (NSW 64378); Long Beach, Jervis Bay, Briggs 12.1963 (NSW 64405).

INTERMEDIATE FORMS

The intermediate forms are mostly characterised by the wider leaves of ssp. *laxa* but the number of flowers and bracts in the head is both intermediate and variable, sometimes on the same plant. The lowest pair of sterile bracts are short, rarely exceeding 5 mm., and vary from relaxed to appressed. The lateral sepals vary in length from 6 to 8 mm. Examination of the anthers indicated variation in length and shape.

The following specimens are considered to represent intermediate forms.

New South Wales: *North Coast:* Red Rock to Corindi, Constable 5.1964 (NSW 64429). *Central Coast:* Putty road, 69 miles S of Singleton, Constable 7.1963 (NSW 64617); Bilpin to Bowen's Creek road, Constable 7.1964 (NSW 64684); Linden, Constable 4.1963 (NSW 63120), 11.1963 (NSW 67129); Linden, Evans 12.1963 (NSW 69269); Cowan to Jerusalem Bay, Evans 12.1963 (NSW 64313); Cowan, Kuring-gai Chase, Evans 12.1963 (NSW 64312), 5.1964 (NSW 68720, 68721, 68722); West Head road, Kuring-gai Chase, Evans 12.1956 (SYD), 12.1963 (NSW 66790, 66921); old Bobbin Head road, Kuring-gai Chase, Evans 5.1964 (NSW 64407); beside fire-trail, Mona Vale road to Cowan Creek, Evans 5.1964 (NSW 64410); Wahroonga, Cambage 12.1913 (SYD); Narrabeen, Fraser & Vickery 12.1933 (SYD); Cheltenham, Johnson 11.1946 (NSW 15591); Killara, Rainbow 12.1928 (NSW 18330); Oxford Falls road, Constable 4.1963 (NSW 63229); Castle Cove, McKee 5.1942 (SYD); Oatley, Camfield 12.1896 (NSW 18345). *Central Tablelands:* 2 miles S of Bodington Homes, King's Tableland, Wentworth Falls, Constable 1.1964 (NSW 64015), 2.1965 (NSW 73618).

Observations have so far indicated that ssp. *gracilis* extends deep into sedge swamps and grows elsewhere only in wet ground, while ssp. *laxa* appears to avoid the more crowded swamp conditions and extends from swampy places and ground liable to flooding into heath. However, plants of intermediate character with broad leaves have been collected in the heart of dense sedge swamp and also under comparatively dry conditions in heath on higher ground not very far away.

TASMANIAN SPECIES WHICH HAVE BEEN CONFUSED WITH *X. GRACILIS*

X. gracilis has been reported from Tasmania by various authors (see references p. 4); however, from the collections in the Sydney and Melbourne herbaria, there is no record of its occurrence there; the true *X. gracilis* with its two subspecies appears to be confined to the mainland of Australia. There appear to be three taxa in Tasmania which at one time or another have been confused with *X. gracilis*. These are as follows.

1. Species " A ". This resembles the mainland *X. gracilis* ssp. *gracilis* in general appearance, but differs in the lateral sepals which have very much broader wings and, to a varying degree, in several other respects, e.g. the flower heads may be subglobular, the fertile bracts then short, broad and very convex. The outer (sterile) bracts may be lax. The chromosome number of $2n = 52$ (Briggs, 1965) differs from those known for both of the subspecies of *X. gracilis* in being at the tetraploid level. Consequently there seems to be a good case for treating it as a distinct species.

SPECIMENS EXAMINED: Tasmania: Heaths at Circular Head, Mueller 2.1875 (MEL); Detention Corner, Gunn No. 1389 p.p., 2.1845 (NSW 20462); ca. 4 miles S of Smithton on Edith Creek road, Johnson 1.1965 (NSW 77849); Hente Siding, near Strahan, Davis No. 9095, 1.1937 (NSW 58327); West Montagu, per Martin 7.1965 (NSW 76396, 76397, 76398).

2. **X. muelleri** *Malme* in Svensk Bot. Tidskr. XXI (1927) 381–383; *X. gracilis* var. *bracteata* Benth., Fl. Austral. VII (1878) 79 (non *X. bracteata* R. Br.).

TYPIFICATION: *X. muelleri* is based on *X. gracilis* var. *bracteata*, which was cited by Malme in synonymy at the head of his description. Bentham cited: South Port, Tasmania, C. Stuart; between Circular Head and Arthur River, F. Mueller. Malme cited: Heaths at Circular Head (F. von Mueller); South Port (Stuart sec. Bentham). Dr R. Melville has kindly examined Bentham's type material at Kew and reports that the Stuart specimen belongs to the species dealt with hereunder. Sheets labelled " Heaths at Circular Head, Contributor Baron von Mueller ", and " Tasmania, F. Mueller, Herb. F. Mueller 1877 " also belong to this species, but in view of the discrepancy in wording it is not certain that these are syntypes. Although Bentham's description is brief, Malme's description indicates that he had the present species in mind. Mueller's collections from " Circular Head " and " Circular Head to Arthur's River " in MEL and NSW include specimens not only of this species but also of species " A " and *X. marginata* (see specimens listed herein under the respective species). Since there is no confusion about the South Port specimen of Stuart this is, in accordance with Dr Melville's suggestion, here selected as LECTOTYPE.

This species is clearly distinguished from both *X. gracilis* and species " A " by the outer, sterile bracts which are lanceolate, acuminate, acute, lax, more than half as long as the subglobose flower-head, often with a distinct ridge or midvein on the outer surface towards the apex. It also differs from *X. gracilis* ssp. *gracilis* and species " A " in the leaves which may be 3 mm. wide or reduced to sheaths. Chromosome number $2n = 26$ (Briggs, 1965).

SPECIMENS EXAMINED: *Tasmania:* Heaths at Circular Head, Mueller (NSW 18382); Detention Corner, Gunn No. 1389 p.p., 2.1845 (NSW 69758); Murchison R. valley, near Tullah, Johnson 1.1965 (NSW 77848); 7 miles from Queenstown on road to Strahan, Phillips 1.1962 (NSW 63119); Strahan, Johnson 1.1949 (NSW 18381).

3. **X. marginata** *Rendle* in Journ. Bot. XXXVII (1899) 503. Although more closely related to *X. operculata* Labill., this has been confused with members of the *X. gracilis* group. On closer examination it is seen to differ markedly. The margins of the lateral sepals are broad and are fimbriate throughout, especially towards the apex. The outermost, sterile bracts are oblong, 4–5 mm. long by ca. 2 mm. broad, passing into the form of the fertile bracts. The ovary has an enlarged, rounded, hardened apex, somewhat resembling that of *X. operculata*. The species is also readily distinguished by the comparatively smooth margin of

the leaf; in transverse section the epidermis is undifferentiated at the margin whereas in the *X. gracilis* group there is a clearly marked marginal zone, with much more thickly cutinised epidermal cells often bearing projections. No chromosome count has been reported on this species.

Specimens Examined: *Tasmania:* Heaths between Circular Head and Arthur R., 2.1875 (MEL); Cradle Valley, Weindorfer 1.1914 (NSW 18380); Strahan, Rodway No. 2710, 12.1892 (NSW 18379); Hobarton, Le Grand (MEL); near Mt. King William, Rodway 12.1917 (NSW 58345); La Perouse, Rodway No. 9100, 12.1898 (NSW 58350); peat soil, Tasmania (MEL); Mt. Counsel, Port Davey area, Davis No. 1466, 3.1954 (MEL).

Most of the specimens cited from MEL were examined by Dr B. G. Briggs, using the criteria adopted in this paper.

ACKNOWLEDGEMENTS

My thanks are due to Mr. John Lewis of the British Museum (Natural History) for valuable criticism of and suggestions upon an early draft of this paper, although he does not agree with all my conclusions. I also wish to thank Mr. L. A. S. Johnson of the National Herbarium of New South Wales for readily giving advice and help on many occasions, to Dr. Barbara Briggs and Miss S. Close for preparing the accompanying figures, and to Dr. Briggs further for examining and reporting on specimens in Melbourne. Mr. D. McGillivray kindly assisted by preparing anatomical sections of leaves and stems. Thanks are also due to the Director of the National Herbarium, Melbourne, for the opportunity to examine specimens and for assistance in other ways, and to Mr. J. B. Williams of the Botany Department, University of New England, for supplying information; to Dr. R. C. Carolin, Curator of the Herbarium, School of Biological Sciences, University of Sydney for consultations and loan of specimens and to Mr. E. F. Constable, Botanical Collector, National Herbarium, New South Wales for diligent collecting of much living and herbarium material.

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Bleeser Specimens in the National Herbarium of Victoria, with some Notes on their Collector

J. H. WILLIS*

As a complement to Dr H. S. McKee's paper "The Bleeser Botanical Collection from Northern Australia" (Contrib. N.S.W. Nat. Herb. III, No. 4 (1963) 233-234), it is appropriate to record also in this journal the few type numbers among F. A. K. Bleeser's collections that are housed at the National Herbarium, Royal Botanic Gardens, Melbourne.

At the end of 1928 or early in 1929, the then Government Botanist of Victoria (Mr. F. J. Rae) received as a donation 102 numbers of North Australian specimens from Bleeser. These embraced 99 species, including 9 of *Acacia* 4 of *Eucalyptus* and 4 of *Calophyllum.* The date given on all of the herbarium labels (Nov. 1929) is the date of incorporation, not of collection which is unknown in most cases.

Eight of these numbers represent duplicate types of species described by O. Schwarz in 1927, half of which were not cited among the holdings at Sydney; a ninth number is the duplicate type of a grass described by R. Pilger (also in 1927):

Bleeser 244. Duplicate of a syntype number of *Cynanchum dichasiale* Schwarz (also in Herb. NSW). Referable to *Secamone elliptica* R. Br.—teste S. T. Blake.

Bleeser 297. Duplicate of type number of *Sideroxylon portus-darwinii* Schwarz (also in Herb. NSW). Referable to *Planchonella arnhemica* (F. Muell.) Royen—teste P. van Royen.

Bleeser 332. Duplicate of type number of *Alectryon bleeseri* Schwarz (also in Herb. NSW). Referable to *Cupaniopsis anacardioides* (A. Rich.) Radlk.—teste S. T. Blake.

Bleeser 421. Duplicate of a syntype number of *Osbeckia koolpinyahensis* Schwarz (also in Herb. NSW). Referable to *Osbeckia australiana* Naudin—teste Sydney Herb.

Bleeser 456. Duplicate of type number of *Acacia lamprocarpa* Schwarz.

Bleeser 479. Duplicate of type number of *Acacia pellita* Schwarz.

Bleeser 502. Duplicate of a syntype number of *Calophyllum ramiflorum* Schwarz.

Bleeser 536. Duplicate of type number of *Eriachne bleeseri* Pilger.

Bleeser 544. Duplicate of a syntype number of *Capparis citrifera* Schwarz.

Of the 102 Bleeser numbers received at Melbourne Herbarium in 1929, two are now missing—viz 312 *Bacopa floribunda* (R. Br.) Wettst., and 548 *Litsea tersa* (L.) Merrill. In addition, however, there is a donation from Sydney Herbarium of *Eucalyptus bleeseri* Blakely, collected by Bleeser near Darwin in Feb. 1927, but it is without a number and is not the type, also a Darwin specimen determined in Berlin by Professor Engler (July 1925) as "*Typhonium oblongifolium*"—a name that appears never to have been published.

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Dr McKee (l.c.) concluded his paper with the remark " Little appears to be known of Bleeser who must have been a keen and competent collector ". In 1956 Bleeser's widow (Mrs. A. M. Bleeser of Malvern, South Australia) kindly supplied the present writer with a number of personal details which fill many gaps in our imperfect knowledge of this worthy naturalist. The following biographical notes aim to set on record something of the background of F. A. K. Bleeser and of his later activities in the Northern Territory.

Florenz August Karl Bleeser was born at Woodside, South Australia, on 5th July, 1871. His father was of Polish descent, and at the early age of 15 or 16 Bleeser senior is believed to have accompanied Dr Richard M. Schomburgk during that botanist's exploratory journeys in British Guiana (1840–44), the boy's especial duty being to assist with the pressing and storing of the plant specimens collected. But it is singular that Dr Schomburgk should make no mention of this fact, nor even of Bleeser's name, in his " *Botanical Reminiscences of British Guiana* " (a 90-page brôchure published at Adelaide in 1876). The mother was a native of Alsace-Lorraine where, as an early orphan, she had been brought up and educated in the Prime Minister's home.

When quite young, F. A. K. Bleeser was placed in the South Australian Postmaster-General's Department. Finding the prospects for a junior employee rather unpromising, he sent in his resignation when still only 18; but the Department countered by offering him promotion if he would transfer to Darwin, and Bleeser gladly accepted the proposition. So, in 1889, began a career in the Darwin Post Office that was to last for 52 years—long after his statutory retirement as Postmaster in 1936. During that half century he put his spare time to good account by collecting and studying the specimens of natural history over much of the Northern Territory. As the late Charles L. Barrett observed, in " *Koonwarra* " (1939) 229-32:

> " He had been everywhere in the North, from the west coast to Arnhem Land; and to the Aru Islands in a lugger. He was familiar with the plants and animals . . . . He knew the haunts and habits of aboriginal tribes, having, in his younger days, made boat voyages around the coast, and trips overland through unexplored country."

C. P. Mountford also paid this tribute in the *Adelaide Advertiser* of 18th May 1956:

> " Although Bleeser was forced, by circumstance, to live the humdrum life of a civil servant, when he would have made his greatest contribution in a science laboratory, he added, more than any man, to the store of knowledge of the natural history around Darwin.
>
> " Perhaps one of the greatest contributions was the hospitality and help which both he and his wife gave to visiting scientists."

Many scientists indeed benefited from the knowledge and companionship of Mr Bleeser, not the least being Dr Hubert Lyman Clark of the Museum of Comparative Zoology at Cambridge, Mass., U.S.A., during his two lengthy visits to Darwin for the purpose of studying sea-urchins (Echinoidea).

Bleeser sent some of his first plant collections for identification to Kew, also to Melbourne, but received no response from either herbarium. Finally, in the mid-1920's, he submitted samples to Berlin, where Dr L.Diels expressed immediate interest and wrote personally to encourage further collection. The duplicate specimens and records held at Darwin were carefully housed in zinc-lined cupboards in a small cottage, built as a private museum in Bleeser's garden.

On 19th February, 1942, following the first Japanese air raid on Darwin, Bleeser and his wife were compulsorily and hastily evacuated with other civilian inhabitants, while military personnel took over the town. They were obliged to move off within a few hours and to take only 35 lbs of luggage. Bleeser's valuable natural history collections and bush-house of growing orchids were left to the mercy of looters who soon destroyed everything of no immediate use to them; none of his botanical material survived. He was never well after leaving Darwin, and no doubt his crushing losses served to hasten his demise in Adelaide later that year (1st November, 1942).

All photographs having been left behind and lost in Darwin, the only existing portrait of Mr Bleeser would seem to be an informal snapshot by Charles Barrett. This was published in the *Victorian Naturalist* L (1933) 184, t. 25, in connection with Bleeser's discovery of a rare tropical orchid that is now considered referable to *Chiloschista phyllorhizus* (F. Muell.) Schlechter. Very probably other references to his natural history interests and achievements lie buried among files of the two Darwin newspapers, *Northern Standard* and *Northern Territory Times*, but the writer has not been able to make the necessary search.

Besides *Eucalyptus bleeseri* Blakely, the discoverer's name is also perpetuated in those of two grasses, *Eragrostis bleeseri* Pilger and *Eriachne bleeseri* Pilger.

A New Species of *Agrostis* from the Australian Alps

Joyce W. Vickery

Agrostis meionectes *J. Vickery*, n. sp.

Gramen annuum (?), parvum, caespitosum, glabrum, ca. 10–30 cm. altum, sitos alpinos vel subalpinos humidos muscosos incolens, ad vel prope basin ramosum innovationibus plerumque intravaginalibus, aliquando extravaginalibus. Culmi graciles, teretes, tenuiter denseque scabri, nodis glabris, internodis inferioribus quam vaginas brevioribus. Vaginae deorsum strictae sursum paullo laxae, tenues, striatae, laeves vel minute scabridae. Ligula membranacea, usque ad 5 mm. longa, acuta vel acuminata vel ultimo laciniata. Laminae planae vel plicatae, tenues, 1–7 cm. longae, 0.75–2.5 mm. latae explanatae, ad apices acuminatae diminutae, tenuiter striatae, 3–7-nervatae, laeves vel praesetim prope vaginas et ad carinas prope apices sparsim et tenuiter scabrae. Panicula in pedunculo scabrido breviter exserta, patens, pyramidalis, usque ad 10 cm. longa lateque, ramis subcapillaribus plus minusve rigide divergenterque patentibus 2–4-nodis, inferioribus 2–5-natis, superioribus 1–2-natis; rami supra basin divisi; rami, ramulique pedicellique tenuiter scabri. Spiculae ad ramulos terminales, plus minusve divergentes, in pedicellis tenuibus clavatis 0.5–3 mm. longis, purpurascentes vel stramineae. Glumae persistentes, divergentes, subaequales vel inferior quam superiorem longior, 3–3.5 mm. longae, acutae vel acuminatae, tenues marginibus hyalinis, lemma excedentes, sursum carinatae, ad carinas tenuiter scabrae, ad latera laeves vel tenuiter scabrae, 1-nervata vel superior 1–3-nervata. Lemma 2–2.5 mm. longum, oblongo-lanceolatum, anguste truncatum dentibus 4 minutis, tenue, hyalinum, obscure 5-nervatum, pilis plus minusve appressis 0.4 mm. longis tenuiter laxeque vestitum, in dorso ex media arista lemma aequanti vel longitudine lemmatis lemma excedenti recta vel vix geniculata. Palea quam lemma paullo brevior, tenuis, hyalina, 2-carinata, marginibus quam interstitium laterioribus. Lodiculi hyalini. Antherae 3, ca. 0.75–1 mm. longae, flavescentes. Ovarium stigmatibus duobus plumosis ad margines apicis anguste truncati. Caryopsis oblonga, utrimque ad latera, paullo sulcata, quam embryonem quadruplo longior. Rhachilla supra lemmata producta, praesertim sursum pilosa.

Holotype: *New South Wales:* Lake Cootapatamba, Kosciusko, 6800 feet, in moist places, amongst *Plantago*, L.A.S. Johnson & E. F. Constable 24.1.1951 (NSW 15995).

Small, densely tufted, glabrous annual (?) ca. 10–30 cm. high, inhabiting alpine and subalpine, moist, mossy sites, branching at or near the base, the shoots mostly intravaginal, occasionally extravaginal. Culms slender, terete, finely and closely scabrous, about 3-noded above the base, the lower internodes shorter than the sheaths, the nodes glabrous. Sheaths close around the culms below, becoming slightly loose upwards, thin, striate, smooth or minutely scabrid. Ligule membranous, up to 5 mm. long, acute or acuminate or at length laciniate. Blades flat or folded, thin, 1–7 cm. long, 0.75–2.5 mm. wide when flattened, tapering to an acuminate apex, finely striate with 3–7 nerves, smooth or lightly and finely scabrous especially on the margins near the sheath and on the keel towards the apex. Panicle shortly exserted on the scabrid peduncle, open, pyramidal at maturity, up to about 10 cm. in length and width with delicate, sub-capillary, but more or less rigidly divergently spreading branches in about 2–4 tiers, the lower 2- to 5-nate, the upper

solitary or 2-nate on the main axis; each branch divaricately dividing again about 0.5–3 cm. from its base to the first to third degree, the branches and pedicels finely scabrous. Spikelets borne at the ends of the branches on more or less divergent, slender, clavate pedicels 0.53 mm. long, purplish to straw-coloured. Glumes persistent, divergent, subequal or the lower slightly exceeding the upper, 3–3.5 mm. long, acute to acuminate, thin, with hyaline margins, exceeding the lemma, keeled upwards, lightly scabrous on the keel, smooth or lightly scabrous on the sides, 1-nerved or the upper 3-nerved. Lemma 2–2.5 mm. long, oblong-lanceolate, narrowly truncate and erose with 4 minute teeth, thin and hyaline, rather thinly and loosely clothed with more or less appressed hairs about 0.4 mm. long, obscurely 5-nerved, with a dorsal awn from barely exceeding the lemma to exceeding it by as much as the length of the lemma and straight to slightly geniculate. Palea about four-fifths as long as the lemma, thin and hyaline, 2-keeled with the margins broader than the intercarinal space. Lodicules hyaline. Stamens 3 the anthers about 0.75 mm. long, yellow. Ovary with 2 feathery stigmas at the edges of the narrowly truncate apex. Grain oblong, slightly furrowed on both sides, the embryo barely one-quarter of its length. Rhachilla produced beyond the floret, hairy, especially upwards.

New South Wales: Carruther's Peak (Kosciusko Plateau), 6350 feet, M. Mueller No. 2938, 5.2.1955 (NSW 71142); Cooma district (but probably from the adjacent mountains), A. C. Taylor 20.3.1953 (NSW 71143); Mt. Kosciusko, near Siemens Hut, alpine herbfield, D. Wimbush 2.1959 (CANB 63715); near Rennix Gap, Mt. Kosciusko, N.T. Burbidge 23.2.1955 (CANB 36033).

Victoria: Mt. Buffalo National Park (at ± 4500 feet), on damp mossy ground beside Crystal Brook, in vicinity of " Tucker-Box " corner, J. H. Willis 21.2.1963 (MEL; NSW 71141).

A. meionectes has the general appearance of an annual but some specimens, especially the Holotype, have some vertical stems at the base with occasional extravaginal buds at the same time as the older culms are bearing inflorescences; this is not entirely inconsistent, however, with an annual growing up through peat or moss. More information regarding its biology is needed.

When first seen I was inclined to regard *A. meionectes* as merely a depauperate plant of *A. aemula* but with the accumulation of collections all manifestly alike from various parts of the Australian Alps there seems no reason to doubt that it should be regarded as a distinct taxon.

From *A. aemula* R. Br. and *A. avenacea* Gmel. it differs in its small stature, the fine short leaves, small panicle, and shorter and not or only slightly geniculate awn.

From *A. preissii* (Nees) J. Vickery of Western Australia it differs in the short and more stiffly divergent panicle branches, scabrous peduncle and internodes, shorter and not or only slightly geniculate awn, and longer anthers.

Algae of the Gilbert Islands

VALERIE MAY

The following algae were collected by Mrs. R. Catala during a trip to the Gilbert Islands in March to July, 1951. The Myxophyceae were kindly identified (in 1951) by Dr Francis Drouet of the Academy of Natural Sciences, Philadelphia, U.S.A., to whom I am greatly indebted. Mrs. Catala reports that some of these Myxophyceae are used by local inhabitants of the Islands in the preparation of the drink Toddy.

The collections are numbered in two series. The collection which consists mainly of Myxophyceae is numbered 1–24, and locations are given in the paper for this group. The Marine Collection is numbered 1–64. The locations for this series are as follows: Nos. 1–30 and 56–64 came from Tarawa Atoll, while Nos. 31–55 came from Abemanna. A few species of Chlorophyceae were collected among the Myxophycean numbers and are here recorded among other Chlorophyceae, while Nos. 47, 48 and 51 of the Marine Collection are here recorded under the Myxophyceae.

The species are recorded alphabetically under the headings Myxophyceae, Chlorophyceae, Phaeophyceae and Rhodophyceae respectively.

The specimens cited form part of my herbarium, located at the National Herbarium of New South Wales, Sydney.

MYXOPHYCEAE

Nos. 3–8 are from Bonriki Atoll, 21.3.1951; Nos. 9–16 are from Butaritari Atoll, 7.4.1951.

COLLECTED FROM WELL WATER:

Phormidium tenue (Menegh.) Gom.; un-numbered.

COLLECTED IN MARINE COLLECTION:

Calothrix pilosa Born. & Flah.; Nos. 48, 51.
Symploca hydnoides Gom.; No. 47.

COLLECTED FROM TIDAL FISH PONDS:

Agmenellum quadruplicatum (Menegh.) Breb.; Nos. 4, 5, 11.
Anacystis dimidiata (Kuetz.) Dr. & Daily; Nos. 4, 5, 18.
Anacystis montana (Lightf.) Dr. & Daily; Nos. 5, 10.
Anacystis thermalis (Menegh.) Dr. & Daily; Nos. 4, 5, 10.
Coccochloris elabens (Breb.) Dr. & Daily; No. 23.
Lyngbya semiplena (Ag.) J. Ag.; Nos. 4, 5, 12, 17.
Lyngbya versicolor (Wartm.) Gom.; Nos. 4, 5.
Oscillatoria nigro-viridis Thw.; Nos. 4, 5.
Plectonema nostocorum Born.; Nos. 3, 4, 5, 6, 11, 17, 23.
Schizothrix lacustris A. Br.; Nos. 23, 24.
Spirulina subsalsa Oerst.; Nos. 4, 5.

COLLECTED ON ROCKS INLAND:

Anacystis montana (Lightf.) Dr. & Daily; No. 16.

Anacystis thermalis (Menegh.) Dr. & Daily; No. 16

Lyngbya semiplena (Ag.) J. Ag.; No. 16.

Oscillatoria nigro-viridis Thw.; No. 16.

CHLOROPHYCEAE

Bryopsis harveyana J. Ag.; No. 45.

Bryopsis plumosa (Huds.) Ag.; No. 62.

Caulerpa peltata Lamour. emend. W. v. B. var. *nummularia* (Harv.) W. v. B.; Nos. 17, 21.

Caulerpa serrulata (Forsk.) J. Ag. emend. Borgs.; No. 64.

Caulerpa serrulata var. *boryana* (J. Ag.) Gilbert; Nos. 2, 34.

Cladophora sp.; No. 37.

Codium sp.; No. 35.

Dictyosphaeria favulosa (Mert.) Decne.; Nos. 4, 12, 27, 28.

Enteromorpha sp., probably *E. intestinalis* (L.) Link; Nos. 13, 22, 39.

Gloeocystis grevillei (Berk.) Dr. & Daily; un-numbered, in Myxophycean collection; from freshwater pond. Kindly determined by Dr F. Drouet.

Halimeda macroloba (Decne.) Bart.; No. 33.

Halimeda sp.; No. 32.

Microdictyon umbilicatum (Velley) Zan.; No. 36.

Neomeris van-bosseae Howe; No. 58.

Palmogloea protuberans (Sm. & Sow.) Kuetz.; in Myxophycean Collection, Nos. 8, 13, 21, 22, 23. Kindly determined by Dr F. Drouet.

Protococcus grevillei (Ag.) Crouan; in Myxophycean Collection, No. 13. Kindly determined by Dr F. Drouet.

Rhizoclonium hieroglyphicum (Ag.) Kuetz.; in Myxophycean Collection, Nos. 18, 19, 20. Kindly determined by Dr F. Drouet.

Struvea delicatula Kuetz.; No. 8.

Udotea orientalis A. & E.S. Gepp; No. 7, 38.

Ulva lactuca L.; No. 31.

Valonia aegagropila Ag.; No. 26.

PHAEOPHYCEAE

Ectocarpus sp.; No. 43.

Notheia anomala Bail. & Harv.; on *Turbinaria* sp., No. 1.

Turbinaria conoides Kuetz.; No. 63.

RHODOPHYCEAE

Centroceras clavulatum Mont.; No. 18.

Ceramium gracillimum Griff. & Harv.; No. 30.

Chondria sp.; Nos. 11, 29.

Endosiphonia spinuligera Zan.; Nos. 10, 15.

Hypnea pannosa J. Ag.; Nos. 23, 59.

Jania sp., probably *J. rubens* (L.) Lamour.; Nos. 6, 24.

Laurencia obtusa (Huds.) Lamour.; No. 14.

Peyssonnelia gunniana J. Ag.; Nos. 42, 52.

Pterocladia pinnata (Huds.) Pap. (formerly known as *P. capillacea* (Gmel.) Born. & Thur.); No. 25.

Further Records of Algae from New Caledonia Collected by Mrs. R. Catala

VALERIE MAY

In 1953 I presented a list of Algae from New Caledonia, collected by Mrs. R. Catala (Contrib. N.S.W. Nat. Herb. II (1953) 38–66). The present paper records some twenty-three additional species that have now been recognised amongst nearly 150 further collections.

My earlier paper recorded collections numbered from 1 to 346. The present paper records collections numbered 337 and from 348 to 478. The dates of collection and detailed locations are as follows:—

Number	*Collection Data*
337	Ilot du Grand Mato, 18.5.1950.
348–409	Ile Pott, 6.1950:
348–362	East coast.
363–376	West coast.
377–399 and 443	South coast.
400–409	North coast.
410–442	200 Km. south of Ilot Tilguit:
410–418	Poindimie, 19.8.1950.
419–442	Ponerihouen, 20.8.1950.
444–478	New Caledonia, Oct.–Nov. 1950.

The species are recorded alphabetically under the four headings: Chlorophyceae, Phaeophyceae, Myxophyceae and Rhodophyceae.

In my earlier paper I pointed out certain similarities in the algal flora of New Caledonia and that of Brampton Island, Queensland. It is of interest to note now that three of the species recorded in the present paper have also been recorded from Brampton Island, viz. *Hormothamnion solutum*, *Dictyosphaeria cavernosa* (Synonym: *D. favulosa*), and *Peyssonnelia gunniana*.

I am most grateful to Dr Francis Drouet of the Academy of Natural Sciences, Philadelphia, U.S.A., who has identified (in 1951-2) the Myxophyceae in this collection. I am also indebted to Dr George Papenfuss, University of California, U.S.A., Dr P. C. Silva, University of Illinois, U.S.A., Dr Yukio Yamada, Hokkaido University, Japan, and Miss C. I. Dickenson, Royal Botanic Gardens, Kew, England, who have been kind enough to examine certain specimens and whose opinions are recorded here regarding Nos. 337, 386, 440 and 442.

The specimens cited form part of my herbarium, located at the National Herbarium of New South Wales, Sydney.

CHLOROPHYCEAE

Acetabularia dentata Solms-Laubach; No. 402.

Bryopsis harveyana J. Ag.; Nos. 361, 368, 374.

Caulerpa fastigiata Mont.; No. 358.

Codium arabicum Kuetz.; No. 386. Kindly identified by Dr P. C. Silva in a letter dated Feb., 1952.

Dictyosphaeria cavernosa (Forsk.) Borgs. (Synonym: *D. favulosa* Decne); No. 387.

Microdictyon umbilicatum (Velley) Zan.; Nos. 353, 454.

Ulva fasciata Delile; No. 477.

PHAEOPHYCEAE

Sargassum sp. near *S. corrifolium* J. Ag., but perhaps not quite referable to this species in the opinion of Dr Y. Yamada in a letter dated Nov. 1951; No. 442.

Sphacilaria furcigera Kuetz.; No. 463.

MYXOPHYCEAE

Hormothamnion enteromorphoides Born. & Flah.; No. 464.

Hormothamnion solutum Born. & Flah.; No. 404.

Hydrocoleum cantharidosmum Gom.; Nos. 364, 406.

Lyngbya confervoides Gom.; No. 362.

Lyngbya sordida Gom.; No. 395.

RHODOPHYCEAE

Actinotrichia fragilis (Forsk.) Borgs. (Synonym: *A. rigida* (Lamour.) Decne.); No. 423.

Amphiroa anceps (Lamour.) Decne.; No. 421.

Carpopeltis multicornis (Kuetz.) D.T.; No. 411.

Champia parvula (Ag.) Harv.; No. 373.

Melanthalia obtusata (Labill.) J. Ag.; No. 467.

Martensia flabelliformis Harv.; Nos. 365, 457.

Peysonnelia gunniana J. Ag.; Nos. 367, 413.

Thysanocladia serrata Harv. Identification checked by Miss C. Dickenson in a letter dated Feb. 1952. No. 440.

Vanvoorstia sp. In a letter dated Sept. 1950, Dr G. F. Papenfuss discussed this species and suggested that it is possibly allied to a South African species of *Vanvoorstia*. No. 337.

New Taxa of *Acacia* from Eastern Australia. No. 1

MARY D. TINDALE

SUMMARY

Three new species of *Acacia* (Family Mimosaceae) from New South Wales are described. *A. fulva* and *A. chrysotricha* are bipinnate wattles of the *A. decurrens* (Wendl.) Willd. group. *A. saliciformis* is a phyllodinous species closely related to *A. mabellae* Maiden.

Acacia fulva *Tindale,* **sp. nov.**

Acaciae mollifoliae affinis, sed differt: foliolis acutissimis, anguste lanceolatis, ovatis vel anguste lanceolato-oblongis, ramulis breviter et dense lanatis, rhachide prope basin omnium pinnarum parium glandulis 1–2 approximatis, etiam in media rhachide inter pinnarum paria glandulis 1–2 approximatis, minimis, interjugalibus, depresso-sphaericis ornata, corolla et calyce pilis longis albis sinuatis vestito, leguminibus inter semina saepe minus constrictis.

Allied to *Acacia mollifolia* but differing in the following ways: pinnules very acute, narrowly lanceolate, ovate or narrowly lanceolate-oblong, the branchlets shortly and densely lanate, the rhachis with 1 or 2 closely spaced glands near the base of all the pairs of pinnae, also bearing 1 or 2 closely spaced, very small, interjugary, depressed-spherical glands midway between the pairs of pinnae, the corolla and calyx clothed with long, white, sinuate hairs, the pods often less constricted between the seeds.

Shrub or tree 1.5 to 10 m. high, the bark smooth and greyish green on young trees but rough and corrugated on older trees. *Branchlets* slightly ridged, the surface and ridges very densely and shortly lanate with velvety, silvery-grey or rusty-coloured hairs about 0.8 to 1 mm. long. *Young tips* chestnut-coloured. *Leaves:* petiole 0.3 to 1.5 cm. long, terete, with 2 black, depressed-spherical glands towards the apex, shortly lanate with silvery-grey or rusty-coloured hairs; rhachis 2.2 to 7 cm. long, terete, clothed as on branchlets, mostly bearing 1 or 2 closely spaced, very small, interjugary, depressed-spherical glands (each with a yellow rim) midway between each pair of pinnae, as well as 1 or 2 closely spaced glands at the base of each pair of pinnae. *Pinnae* 4 to 10 pairs, 3 to 7.5 cm. long, 0.7 to 1.5 cm. broad, silvery-greyish. *Pinnules* 11 to 26 pairs, 3 to 9 mm. long, 1.2 to 2 mm. broad, narrowly lanceolate (6: 1) to ovate (2: 1) or narrowly lanceolate-oblong (6: 1), the apex sharply acute with an apical tuft of white hairs, the lower surface lanate with long, weak, silvery hairs which also occur along the margins in addition to a few on the upper surface. *Heads* bright yellow, globose, in racemes or panicles, each head composed of about 26 to 28 flowers, the peduncles stout, 0.5 to 0.8 mm. in diam., tomentose with fawn or chestnut-coloured hairs; buds densely clothed with castaneous hairs. *Bracteoles* with a broad, ciliolate or glabrous pedicel which is expanded into a pear-shaped, dilated, curved, apical portion densely clothed with long, white or fawn hairs, the apical tuft of hairs often as long as the pedicel. *Calyx* 1 to 1.2 mm. long, obconical, very shortly 5-lobed, fawn, scarcely angled, clothed with long, white, weak, sinuate hairs on the lobes and a few on the angles of the tube. *Corolla* about 2 mm. long, fawn, deeply dissected, with 5 acute, narrowly lanceolate lobes, clothed with a few, long, white, weak, sinuate hairs especially towards the apex. *Stamens* numerous, the filaments about 1.5 to 2.2 mm. long. *Anthers* bilocular.

Ovary sessile, dark brown, broadly oblong (3: 2), the apex rounded and bearing a tuft of long, white hairs. *Style* laterally attached. *Legumes* stalked, thickly coriaceous, dark brown, almost straight-sided, 6 to 11 cm. long, 5 to 6 mm. broad, densely lanate, with soft, castaneous and silvery hairs, 1 to 1.2 mm. long. *Seeds* black, dull, longitudinal in the legumes, oblong-elliptical; funicle filiform at first with a loop, then thickened into a fleshy pileiform aril over the top of the seed, the areole prominent.

Holotype: Northern slope of Mt. Wareng, Howes Valley, New South Wales, small shrubs 6 to 8 ft. high to trees 25 to 30 ft. high, bark on younger trees smooth and greyish green, older trees rough and corrugated, flowers bright yellow, foliage silvery grey, basalt, 700 ft. alt., Constable No. 4220, 4.1963 (NSW 63249), located in the National Herbarium of New South Wales, Sydney. Isotypes: K; A.

Distribution: This species has a limited distribution, being recorded only from Gloucester Buckets, on the lower North Coast, and from Mt. Wareng, near Howes Valley, New South Wales.

Flowering Period: April to June.

Length of Legume Formation: Mature fruit occur on the trees or shrubs from April until November.

Specimens Examined: *New South Wales: North Coast:* Gloucester Buckets, near Gloucester, Maiden 9.1897 (NSW 8141); Gloucester, Betche 1.1882 (NSW 8140). *Central Coast:* Fire Trail to Mt. Wareng, ca. 2 miles E of Howes Valley, shrubs to small trees up to 20 ft. high, alt. 800 ft., in association with *Senecio* sp., *Jacksonia*, *Exocarpos*, *Clematis* and *Clerodendrum*, basalt, Constable 8.1959 (NSW 48118); Howes Valley Post Office to Mt. Wareng, ca. 1 mile E of Post Office, small shrub 5 to 10 ft. high, bark rough and dark brown, alt. 800 ft., Constable 8.1957 (NSW 44440); Mt. Wareng, 5 miles E of Howes Valley (ca. 25 miles SSW of Singleton), trees 6 to 9 m. high, confined to one area on middle slopes of mountain, basalt, Constable No. 4289, 7.1963 (NSW 70802; K; US; A; L; UC; U; MO; BR; NY); Mt. Wareng, ca. 2 miles E of Howes Valley Post Office, trees 25 to 30 ft. high, flowers pale yellow, pods light to dark brown, bark smooth on smaller trees, corrugated on older and taller trees, localized to stony basalt ridge at foot of mountain, 800 ft. alt., Constable No. 4785, 5.1964 (NSW 70826; BR; NY; UC; US; L).

This species is very closely allied to *Acacia mollifolia* Maiden et Blakely in Proc. Roy. Soc. N.S.W. LX (1926) 1927, 192. In fact Maiden & Blakely included this species in their description, having cited NSW 8140 and 8141 from Gloucester and Gloucester Buckets respectively. *A. mollifolia* has been recorded from the Central Western Slopes of New South Wales as well as from one locality in the Central Tablelands of this state.

In *A. mollifolia* the pinnules are more cultrate or linear with rounded or truncate instead of very acute apexes, also the branchlets are shortly tomentose and the legumes often more constricted between the seeds. Interjugary glands occur on the rhachises between the pairs of pinnae in *A. fulva* but are absent in *A. mollifolia*. Both species are characterized by very similar bracteoles but the flowers are different. The petals and the lobes of the calyx in *A. fulva* have a number of long, fine, weak, white hairs on their outer surfaces. The ovary in *A. mollifolia* is mid-brown and glabrous instead of dark brown with a tuft of long, white hairs as in *A. fulva*.

Acacia chrysotricha *Tindale*, **sp. nov.**

Arbor 6.6–23.3 m. alta, trunco usque ad 0.3 m. diam., cortice truncorum in arboribus junioribus leviter longitudinaliter sulcato, griseo, sed in arboribus vetustioribus rufo-atrobrunneo, profunde sulcato. Ramuli vix costati, ubique pilis patentibus, longis, atrogriseis, aureis vel fulvis, 0.8–1.2 mm. longis dense ornati. Ramuli novelli atro-aurei. Folia: petiolus vix costatus, 0.3–1 cm. longus, eglandulosus, ut ramuli vestitus; rhachis vix costata, 7–12.5 cm. longa, ut ramuli vestita, eglandulosa vel glandulis 1–3 sphaericis, atrobrunneis, glabris tantum ornata,

glandula una basi pinnarum parium vel inter pinnarum paria 1–3 infima et/vel glandula una basi pinnarum parium 1–2 suprema praedita. Pinnae 12–17-jugae, 1.5–5 cm. longae, 0.4–0.8 cm. latae, supra atrovirides, subtus pallidiores. Foliola 12–23-juga, oblonga vel oblongo-elliptica, 3–4.5 mm. longa, 1–1.5 mm. lata, pilis paucis, longis, albis vel aureis supra et subtus vestita, apice acuta vel subacuta. Capitula laete aurea, globosa, in racemis vel paniculis disposita, floribus 21–23; pedunculis pilis aureis breviter pilosis. Bracteolae ca. 0.3 mm. longae, brunneae, spathulatae, sursum dilatatae, curvatae, dense ciliolatae, petiolo lato, dense ciliolato. Calyx ca. 0.1 mm. longus, parvus, brunneus, breviter quinquelobatus, angulatus, costis tubi ciliolatis; lobis obtusis, apicem versus ciliolatis. Corolla 0.5 mm. longa, quinquelobata, tubo glabro, lobis acutis, loborum apicem versus pilis paucis longissimis albis ornata. Stamina numerosa, filamentis circiter 2–3 mm. longis. Antherae biloculares. Ovarium subsessile, glabrum, ovale. Stylus glaber. Legumina stipitata, coriacea, atrobrunnea vel nigra, submoniliformia, 6.5–8.5 cm. longa, 4–6 mm. lata, pilis longis deciduis atrobrunneis vestita.

Tree 6.6 to 23.3 m. high, trunk up to 0.3 m. in diam., the bark of younger trees grey and lightly fissured vertically but on the older trees dark red-brown with deep fissures. *Branchlets* inconspicuously ridged, the surface and ridges densely clothed with spreading, dark grey, golden or fawn hairs 0.8 to 1.2 mm. long. *Young tips* deep golden-yellow. *Leaves:* petiole slightly ridged, 0.3 to 1 cm. long, eglandulose, clothed as on the branchlets; rhachis scarcely ridged, 7 to 12.5 cm. long, clothed as on the branchlets, eglandulose or bearing only 1 to 3 spherical, dark brown, glabrous glands, 1 gland at the base of or between the 1 to 3 lowest pairs of pinnae and/or 1 gland at the base of the 1 or 2 uppermost pairs of pinnae. *Pinnae* 12 to 17 pairs, 1.5 to 5 cm. long, 0.4 to 0.8 cm. broad, dark green above, paler beneath. *Leaflets* 12 to 23 pairs, oblong to oblong-elliptical, 3 to 4.5 mm. long, 1 to 1.5 mm. broad, clothed on both surfaces with a few, long, white or golden hairs, the apex acute or subacute. *Heads* bright golden, globose, in racemes or panicles, with 21 to 23 flowers; the peduncles clothed with golden, shortly pilose hairs. *Bracteoles* about 0.3 mm. long, brown, spathulate, dilated above, curved and densely ciliolate. *Calyx* ca. 0.1 mm. long, small, brown, shortly 5-lobed, angled, the ribs of the tube ciliolate, the lobes obtuse, ciliolate towards the apex. *Corolla* 0.5 mm. long, 5-lobed, the tube glabrous, the lobes acute, towards the apex of the lobes clothed with a few, very long, white hairs. *Stamens* numerous, the filaments ca. 2 to 3 mm. long. *Anthers* bilocular. *Legumes* stipitate, coriaceous, dark brown or black, submoniliform, 6.5 to 8.5 cm. long, 4 to 6 mm. broad, clothed with long, deciduous, dark brown hairs.

HOLOTYPE: Connell's Creek, on Compt. 24 of Newry State Forest, just south of Urunga, on a side gully 40 to 50 ft. high, 8 inches in diam. at the base, one tree 70 ft. high, 12 inches in diam., A. Floyd 7.1961 (NSW 34451), located in the National Herbarium of New South Wales, Sydney. ISOTYPES: K; US; A; BRI; AD; MEL; NY; L; UC.

DISTRIBUTION: This species appears to have a very restricted range, as it has only been found in the Brierfield-Newry State Forest region of the North Coast, N.S.W.

FLOWERING PERIOD: Early and mid-August.

LENGTH OF LEGUME FORMATION: The month in which mature legumes are formed is November. The old fruit associated with NSW 55364 were found on the ground under the trees of *A. chrysotricha* on the 18th August 1961.

SPECIMENS EXAMINED: *New South Wales:* Brierfield, Bellinger River, a beautiful tree in thicket growth, flowering, height 30 ft., Swain No. 206, 8.1910 (NSW 8153); Newry State Forest, tree 20 ft. high, in gully, in poor rainforest, bark grey and brown, smooth on young trees, Floyd and Tindale, 8.1961 (NSW 55364); ditto, Lowery 8.1957 (Forestry Comm. Herb., Coffs Harbour).

A. chrysotricha has a very restricted distribution but, if it were originally much wider, this is certainly not indicated by herbarium specimens. Swain's collection of this species at Brierfield, N.S.W., in 1910, is the earliest record of *A. chrysotricha* which I have examined. It does not spread rapidly after a fire, as do other bipinnate wattles native to the North Coast. This species is very ornamental and should make a showy tree in parks. It often grows to 40 or 50 ft. in height and 8 inches in diameter at the base, although it occasionally reaches 70 ft. in height and a foot in diameter. The bark of the smaller trees is grey and lightly fissured vertically but on larger trees it is dark red-brown with deep fissures resembling that of *Eucalyptus fibrosa.*

This wattle occurs as an understory in rather steep, narrow gullies where *Eucalyptus pilularis* dominates the higher slopes together with *Syncarpia glomulifera* and *Tristania conferta.* The soil contains much free quartz up to 1½ inches in diameter, being derived from the somewhat metamorphosed Nambucca Series of shales which contain quartz veins. I am indebted to Mr. A. G. Floyd of the Research Section, Forestry Office, Coffs Harbour Jetty, for his helpful observations on this species and his assistance with my field work.

Acacia saliciformis *Tindale*, sp. nov.

Frutex vel arbor 2.5–7 m. alta, ramis pendulis, trunco erecto, cortice trunci laevi, argenteo vel caeruleo-griseo. Ramuli angulati, glauci, glabri. Surculi juniores rubidi. Phyllodia angustissime elliptica, subcoriacea vel coriacea, recta vel falcata, 6.3–12 cm. longa, 0.7–1.5 cm. lata, basi abrupte contracta, apice acuminato, acriter pungente, mucrone recto vel adunco, marginibus nervosis, glandula unica reniformi a basi phyllodii circiter 1.3–4 cm. remota, vena mediana utrinque prominente, lateralibus reticulato-ramosis, praeter venam e glandula decurrentem, aliquanto obscuris. Capitula pallide flava, globosa, in racemis disposita, floribus 20–32, pedunculis glabris, 5–9 mm. longis, circiter 0.2–0.3 mm. latis. Bracteolae peltatae, sursum dilatatae, dense ciliolatae, petiolo longo, ciliolato. Calyx circiter 1 mm. longus, obconicus, profunde quinquelobatus, sepalis spathulatis, late rotundatis, dense ciliolatis, tubo flavo, apicem versus sparse ciliolato. Corolla 2 mm. longa, glabra, petalis 5 liberis acutis, basin versus attenuatis, marginibus granulosis. Stamina numerosa, filamentis circiter 3–4 mm. longis. Antherae biloculares. Ovarium subsessile, atrobrunneum, oblongo-ellipticum vel anguste lanceolato-oblongum, glabrum, circiter 0.5 mm. longum. Stylus glaber. Legumina longe stipitata, coriacea, atrobrunnea vel pruinosa, glabra, 7–12 cm. longa, 1.3–1.8 cm. lata, inter semina non contracta. Semina nigra, nitida, oblongo-elliptica, 6.8–8 mm. longa, 3–4 mm. lata, in legumine longitudinaliter disposita, funiculo primum filiformi deinde in arillum pileiformem super seminis apicem incrassato, areolo prominente.

Shrub or tree 2.5 to 7 m. high, with pendulous branches, the trunk erect, the bark of the trunk smooth, silvery and blue-grey. *Branchlets* ridged, glaucous, glabrous. *Young shoots* red. *Phyllodes* very narrowly elliptical, subcoriaceous or coriaceous, straight or falcate, 6.3 to 12 cm. long, 0.7 to 1.5 cm. broad, the base abruptly contracted, the apex acuminate, sharply pungent, the mucro erect or hooked, with the margins thickened, bearing a single reniform gland 1.3 to 4 cm. from the base, the median vein prominent on both sides, the lateral veins reticulately branched. somewhat obscure, except the vein decurrent from the gland. *Heads* pale yellow, globose, borne in racemes, with 20 to 32 flowers, the peduncles glabrous, 5 to 9 mm. long, 0.2 to 0.3 mm. broad. *Bracteoles* peltate, dilated above, densely ciliolate, the petiole long and ciliolate. *Calyx* about 1 mm. long, obconical, deeply 5-lobed, the sepals spathulate, broadly rounded, densely ciliolate towards the apex of its yellow, sparsely ciliolate tube. *Corolla* 2 mm. long, glabrous, the 5 petals free, acute, attenuated towards the base, the margins granulose. *Stamens* numerous, the filaments about 3 to 4 mm. long. *Anthers* bilocular. *Ovary* subsessile, dark brown, oblong-elliptical or narrowly lanceolate-oblong, glabrous, about 0.5 mm. long. *Style* glabrous. *Legumes* long-stalked, coriaceous, dark brown or pruinose, glabrous, 7 to 12 cm. long, 1.3 to 1.8 cm. broad, not contracted between the seeds. *Seeds* black, glossy, oblong-elliptical, 6.8 to 8 mm. long, 3 to 4 mm. broad, placed longitudinally in the legume, the funicle at first filiform, later thickening into a pileiform aril over the apex of the seed, the areole prominent.

HOLOTYPE: 1 mile north of Colo Heights, ca. 1000 ft. alt., flower-heads pale yellow pendulous shrub or small tree 9 to 15 ft. high, in dry sclerophyll forest, associated with *Acacia parvipinnula*, M. Tindale 18.6.1960 (NSW 54041), located in the National Herbarium of New South Wales, Sydney. ISOTYPES: US; K; L; A.

DISTRIBUTION: Central Coast of New South Wales from the Mt. Kindarun district southwards to Bilpin and westwards to Glen Davis district.

FLOWERING PERIOD: March to September.

LENGTH OF LEGUME FORMATION: Probably 6 to 7 months. Mature legumes occur on the trees and shrubs from October to December, also March and early April.

SPECIMENS EXAMINED: *New South Wales:* Near " Three Ways " on the Kindarun-Coricudgy Fire Trail, towards Mt. Monundilla, 2000 ft. alt.?, shrubs 3 m. high, abundant in this rugged, sandstone country, flowers pale creamish-yellow, Johnson 5.1962 (NSW 61044); SSE of Mt. Kindarun, at about 10 miles NNW of Putty, shrubs up to 10 ft. high, common on sandstone ridges throughout the area, Johnson 9.1959 (NSW 54061; KANU; AD; MEL; PERTH; NY; CANB; U); Mt. Wareng-Wollombi road (ca. 25 miles S of Singleton), shrubs up to 10 and 12 ft. high, flowers pale yellow, smooth bark, pendulous habit, frequent in all areas, sandstone, alt. 600 ft., Constable No. 4225, 4.1963 (NSW 63256; US; A; UC; BR); Howes Valley to Putty, 12 ft. high, Johnson 9.1951 (NSW 65748); Macdonald River, Howes Valley, about 40 miles from Singleton, about 6 to 8 ft. high, somewhat pendulous, Cambage No. 1539, 7.1906 (NSW 65749); Grassy Hill, Colo Heights–Putty Road, slender shrub 5 to 6 ft. high, flowers pale yellow, young tips of branches reddish, rather pendulous habit, occasional, sandstone, alt. 1600 ft., Constable 8.1959 (NSW 54060; L; US); N of Colo Heights, slender shrubs up to 8 ft. high, flowers pale yellow, young shoots reddish, local in small clumps on sandstone ridge, disturbed area after fire and road building, Johnson & Constable 9.1959 (NSW 54062; BRI; L; BR; MEL; U; K; A; NY; UC); ditto, shrub sometimes 8 ft. high, in sandy soil, in sclerophyll forest, Evans & Blaxell 12.1960 (NSW 54059; RIO); 1 mile N of Colo Heights, tree 12 ft. high, with drooping branches, in dry sclerophyll forest, in sandy soil, associated with *Pultenaea scabra*, *Acacia parvipinnula* and *A. ulicifolia*, Tindale 11.1959 (NSW 48874; K; US; MEL; BRI; AD; L; NY; A; UC; CANB; KANU; PERTH); Upper Colo, tree 15 to 20 ft. high (with slender weeping habit, flowers cream, Ingram 8.1963 (NSW 63853); 3 miles NE of Bilpin, alt. 1800 ft., frequent in wet sclerophyll forest on sandy soil, flowers pale yellow, stems very glaucous, Briggs 3.1961 (NSW 53742).

This species is very prevalent on the sandstone ridges in dry sclerophyll forest along the Windsor-Singleton Road, especially between Howes Valley and Colo Heights, although more rarely it occurs in wet sclerophyll forest. The weeping, willow-like habit of the plant is perpetuated in the specific epithet. This species commonly grows in association with *Acacia parvipinnula.*

A. saliciformis is closely allied to *A. mabellae* Maiden which occurs on the South Coast and Southern Tablelands of New South Wales. The latter species may be readily distinguished from *A. saliciformis* by the golden pubescence on the peduncles of the inflorescences and the attenuated bases of the phyllodes.

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Chromosome Numbers of Some Australian Monocotyledons

BARBARA G. BRIGGS

SUMMARY

Chromosome number determinations are presented for 53 species, mostly native in Australia. These include the first counts on certain species of *Triglochin, Damasonium, Anarthria, Lepyrodia, Lyginia, Leptocarpus, Hypolaena, Calorophus, Coleocarya, Lepidobolus, Loxocarya, Centrolepis, Xyris, Eriocaulon, Murdannia, Aneilema, Pollia, Commelina, Philydrum, Helmholtzia, Schelhammera* and *Xanthorrhoea.* Illustrations and brief comments on the taxonomy of many of the species are included.

The chromosome numbers reported in this paper are largely in groups under taxonomic investigation in the preparation of the Flora of New South Wales. Descriptions of the species occurring in this State, with details of most of the voucher specimens, will be included in the Flora treatments by Alma T. Lee (Xanthorrhoeaceae), L. A. S. Johnson and O. D. Evans (Restionaceae, Centrolepidaceae, Commelinaceae, and Philydraceae), and O. D. Evans (Flagellariaceae, Xyridaceae, Eriocaulaceae, and Pontederiaceae).

Most of the chromosome number determinations were made on root-tips, vegetative shoots or pre-meiotic floral buds, pre-treated with saturated aqueous *p*-dichlorobenzene for 2¼ hours. Staining by alcoholic-carmine (Snow 1963) or aceto-orcein was used.

The species listed in Table I are, for the greater part, native in Australia; there are also three naturalised species and two counted on cultivated material (one of the last group, *Zebrina pendula*, also being naturalised in some areas). The non-native species are marked by asterisks.

The counts are given as somatic numbers, the few determined at meiosis being marked (‡). Somatic numbers are also given in citing previous determinations. The State from which the sample was obtained is indicated under " locality " as follows: New South Wales (N), Queensland (Q), Victoria (V), Tasmania (T) and Western Australia (W). Voucher specimens, listed by their registration numbers, have been placed in the National Herbarium of New South Wales. If there have been several previous counts on a species, no attempt is made to cite all such records; where possible reference is made to an author who gives discussion and mentions earlier findings.

The counts listed are by the author, except for that made on material of *Pollia crispata* from Mount Glorious, Queensland. I am indebted to Dr. B. A. Barlow of the University of Queensland for permission to cite this finding.

NOTES

(a) TRIGLOCHIN. Previously recorded counts are on members of Subgenus *Triglochin*, whereas *T. procera* has been placed in Subgenus *Cycnogeton* (Buchenau 1903). Although $2n = 32$ is also recorded in *T. bulbosum* L. most of the counts suggest a base number of $x = 6$. In *T. procera* one pair is distinctly longer than the other chromosomes (Fig. 6). This feature is not visible in the species illustrated by Skalińska et al. (1961).

TABLE I. CHROMOSOME NUMBER DETERMINATIONS

See text for explanatory notes and details of listing procedure.

Name		2*n*	Locality	Voucher	Fig.	Notes	Previous count
JUNCAGINACEAE							
Triglochin *procera* R. Br.		32	N Albion Park	65826	6	a	
ALISMATACEAE						b	
Sagittaria **graminea* Michx. var. *weatherbiana* (Fernald) Bogin		22	N Casula	68299	1		22 Baldwin and Speese 1955 (as *S. weatherbiana*).
Alisma *plantago-aquatica* L.		14	N Albion Park	65825	2		14 Björkqvist 1961, Löve & Löve 1961.
Damasonium *minus* (R. Br.) Buchen.		42	N Glenfield	71634	3, 4		
FLAGELLARIACEAE							
Flagellaria *indica* L.		38	N Seal Rocks	64995	7		38 Chuang et al. 1962
RESTIONACEAE						c	
Anarthria *prolifera* R. Br.	♂	22	W Busselton	57058	8		
laevis R. Br.	♀	44	W Busselton	57049	..		
scabra R. Br.	♂ ♀	44 ca. 44	W Esperance W Esperance	65792 65791	.. ..		
Lepyrodia *flexuosa* (Benth.) L. Johnson & O. Evans	♀	14	V Grampians	73021	10	d	
tasmanica Hook. f.	♀	18	T Navarre R. to King William Ra.	72717	..		
	♀	18	T West Montagu	76394	..		
Lyginia *barbata* R. Br.	♂	14	W Bunbury	57053	9	e	
Restio *tetraphyllus* Labill. ssp. *tetraphyllus*	♂	22	T Strahan	72720	..		22 Briggs 1963, ssp. *meiostachyus*
complanatus R. Br.	♀	24	N Budderoo, S. of Robertson.	64831	..		24 Briggs 1963
	♀	24	T West Montagu	76393	..		
Leptocarpus *tenax* (Labill.) R. Br.	♂	22	N Hat Head	60652	11		22 Sands in Briggs 1963.
	♂ ♀	22 22	N Manly W Busselton	56880 57056	.. ..		
aristatus R. Br.	♀	22	W Cannington	57051	..		
coangustatus Nees	—	22	W Bunbury	57050	..		
Hypolaena *fastigiata* R. Br.	♂ ♂ ♂	66 ca. 66 66	N North Head N Anna Bay V Lemon Springs, S of Kaniva.	60686 60650 72887	.. .. ..	f	
exsulca R. Br.	♀	26	W Cannington	57453	12		
Calorophus *minor* Hook. f.	♂ — ♂	24 24 24	N Anna Bay N Northbridge N Happy Jack's Creek.	60655 64620 64419	.. 14 ..		

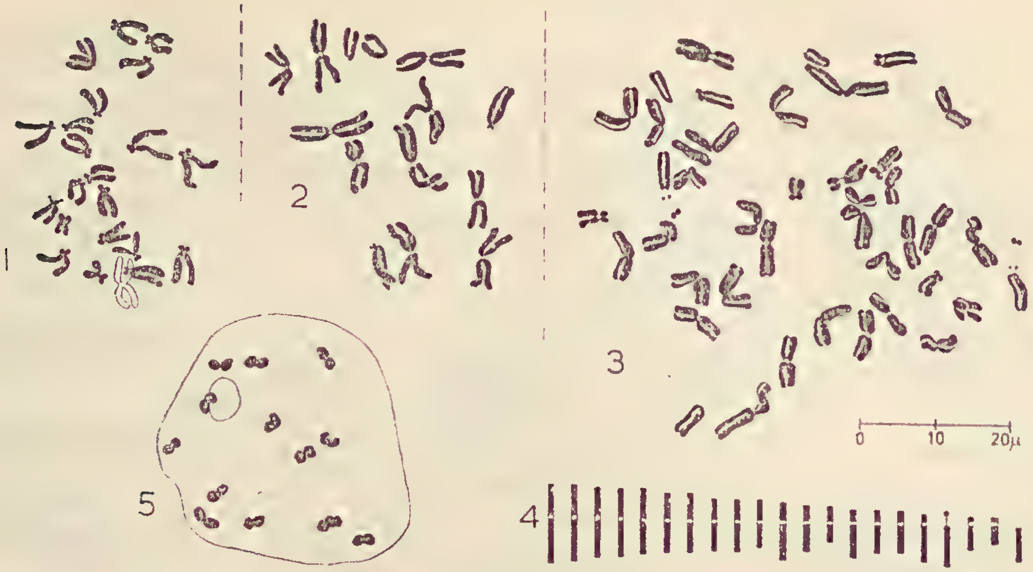
Table 1—*continued*

Name		2*n*	Locality	Voucher	Fig.	Notes	Previous count
Coleocarya							
gracilis S. T. Blake	⚥	22	N Hat Head ..	60647	..		
	⚥	22	N Hat Head ..	60648	..		
Lepidobolus							
drapetocoleus F. Muell.	♀	24	V Lemon Springs, S. of Kaniva ..	72886	17		
Loxocarya							
pubescens (R. Br.) Benth.	♂	24	W Busselton ..	57052	..	g	
sp.	♀	24-26	W Bunbury	57057	..		
fasciculata (R. Br.) Benth. ..	—	102-104	W Bunbury	57059	13		
CENTROLEPIDACEAE							
Centrolepis							
fascicularis Labill.		26‡	N Blackheath ..	77850	5	h	
		26	N Wentworth Falls	64363	..		
		26	T near Smithton ..	72729	..		
XYRIDACEAE							
Xyris							
operculata Labill.		26‡	N Dee Why ..	59892	..	i	
		26	T West Montagu ..	76395	..		
ustulata Nilss.		26‡	N Blackheath ..	66547	..		
gracilis R. Br.							
ssp. *gracilis*		26	N Blackheath ..	66546	..		
ssp. *laxa* O. Evans		26	N Marley Beach ..	57708	..		
gracilis-laxa intergrade		26	N Linden	67129	..		
		26	N Red Rock to Corindi.	64429	..		
sp. A		52-54	T near Smithton ..	77849	..		
		52	T West Montagu ..	76396	..		
muelleri		26	T Tullah	77848	..		
complanata R. Br.		52	N Howes Valley ..	64571	16		
		52	N Kurnell	64406	..		
		50-52	N Agnes Banks ..	69636	..		
juncea R. Br.		26	N Corindi	64614	15		
		26	N Darke's Forest Rd.	66914	..		
		26	N Currarong ..	67511	..		
ERIOCAULACEAE							
Eriocaulon							
scariosum Sm.		64	N Agnes Banks ..	64027	..		
COMMELINACEAE							
Murdannia							
graminea (R. Br.) Brückn.		40	N Richmond ..	64353	22	j	
Aneilma							
acuminatum R. Br.		32	N Whian Whian S.F.	64617	..	k	
		32	N Allyn R.	64587	23		
Pollia							
crispata (R. Br.) Benth.		32‡	Q Mt. Glorious ..	..	..	l	
		32	N SW of Bellingen	64623	..	m	
		32	N Allyn R.	64586	25		
macrophylla (R. Br.) Benth.		32	Q near Beatrice R.	71632	..		
Commelina							
cyanea R. Br.		44	N Euroka, near Glenbrook.	64618	..	n	
		44	N S of Glenbrook	64383	..	o	
		88	N Coffs Harbour ..	64624	..		
		88	N Alum Mountain	..	..		
		88	N Vaucluse	64588	28		
		88	N Lilyvale	..	..		
		88	Lord Howe Is. ..	78667	..		
aff. *cyanea*		44	Q Townsville ..	71633	..		

Table 1—*continued*

Name	2*n*	Locality	Voucher	Fig.	Notes	Previous count
Commelina (continued)						
*" sellowiana " = *C. diffusa* Burm. f.?	60	N Roseville, cult.	64415	..		30 Lewis 1964, 28 Morton 1956 (both as *C. diffusa*).
Tradescantia					p	
**albiflora* Kunth.	60	N Bowen's Creek	65786	..		72 see Darlington & Wylie 1955
	60	N Roseville	64734	21		
	60	N Milperra	71577	..		
	60	N Narrabarba	72111	..		
Zebrina						
**pendula* Schnizl.	24	N Coffs Harbour, cult.	64613	..	p	24, 48 see Darlington & Wylie 1955.
	24	N Sydney, cult	64585	..		
PONTEDERIACEAE						
Eichhornia						
**crassipes* (Mart.) Solms	32	N Parramatta	74101	..		32 see Darlington & Wylie 1955
PHILYDRACEAE						
Philydrum						
lanuginosum Banks & Soland. ex Gaertn.	16	N Valley Heights	68295	26		
	16	N Glenfield	71682	..		
Helmholtzia					q	
acorifolia F. Muell.	34	Q Walsh R., Atherton	64360	..		
glaberrima (Hook. f.) Caruel	34	Q cult, ex Binnaburra.	68296	19		
	34	N Whian Whian S. F.	64861	..		
LILIACEAE						
Schelhammera						
undulata R. Br.	36	N Cobargo	65844	24		
	36	N Popran Creek	78665	..		
XANTHORRHOEACEAE						
Xanthorrhoea					r	
australis R. Br. ssp. *australis*	22	N Mt. Spirabo	56738	..		
	22	N Cobark	65650	..		
arborea R. Br.	22	N St. Helena, near Woodford.	56901	..		
media R. Br. ssp. *latifolia* A. Lee	22	N Doyalson	34429	..		22 Waterhouse in Darlington & Wylie 1955, ssp. *media*
resinosa Pers. ssp. *resinosa*	22	N Heathcote	68995	18		22 Waterhouse (l.c.) as *X. hastile*
minor R. Br.	22	V Orbost	72114	..		
minor—australis intergrade	22	T Tam O'Shanter Bay.	72129	..		
macronema F. Muell. ex. Benth.	22	N Kendall S.F., Kew	64591	20		
AGAVACEAE						
Doryanthes						
excelsa Corr.	48	N Calga	65793	27	s	48 Satô 1938

(b) ALISMATACEAE. In *Alisma plantago-aquatica* various authors have reported numbers within the range $2n = 10$ to $2n = 16$; however, extensive sampling by Björkqvist (1961) showed only $2n = 14$. The karyotype of the Australian material examined agrees with that illustrated by Björkqvist from Europe. The species is generally regarded as native in Australia; the lack of morphological and chromosomal divergence, over so extensive a range, is notable.



Figs. 1—4 Mitotic chromosomes; Fig. 5 meiosis, late prophase. × 850.

1. *Sagittaria graminea* var. *weatherbiana* $2n = 22$.
2. *Alisma plantago-aquatica* $2n = 14$.
3 and 4. *Damasonium minus* $2n = 42$, metaphase and idiogram of haploid complement.
5. *Centrolepis fascicularis* $n = 13$.

Much attention has been directed to certain members of the Alismataceae, but the present count of *Damasonium* is apparently the first on this genus. It is presumably hexaploid, resempling *Alisma* in base number ($x = 7$), the large proportion of chromosomes with sub-median centromeres, and in the presence of telocentric and metacentric pairs. The number $2n = 42$ has been reported in *Alisma canaliculatum* A. Br. et Bouché, in which a karyotype similar to that in *A. plantago-aquatica* is replicated without obvious change. In *Damasonium minus*, however, several distinctive chromosome types are represented by only a single pair. If this has arisen from diploids resembling *A. plantago-aquatica* in karyotype, the polyploidy would appear to be long-established, and considerable further changes in chromosome form must have occurred.

The genus *Sagittaria* shows considerable constancy of karyotype and Fig. 1 agrees with the generalised idiogram for the genus given by Brown (1946) and with the observations of Baldwin and Speese (1955).

(c) Restionaceae. Other counts on this family, particularly in *Lepyrodia* ($2n = 14, 18$) and *Restio* ($2n = 14, 22, 24, 32$, ca. 44) are given by Briggs (1963) who discusses possible basic chromosome numbers for the family, and draws attention to the repeated occurrences of the numbers $x = 7$ and $x = 11$ in diverse genera. The new counts add to the representation of the number $x = 12$; the four genera, *Restio*, *Calorophus*, *Lepidobolus*, and *Loxocarya*, in which this occurs, not being closely allied to one another. There is marked variation in chromosome size in the family, although, as far as known, there is reasonable uniformity of size within each genus. Species of different genera may have the same chromosome number but very different chromosome size (compare *Anarthria* and *Leptocarpus*, Figs. 8 and 11), and suggestions as to the course of chromosomal evolution cannot be based on the numbers alone. The largest chromosomes observed are in *Anarthria* and *Lyginia*, each of which shows a number of apparently primitive morphological features. However, phylogenetic interpretations clearly require much more extensive data and cytotaxonomic studies on the family are being continued.

(d) LEPYRODIA. Johnson and Evans (1963) divided the Australian species of this genus into two groups on the basis of stem anatomy, these groups being correlated, as far as known, with chromosome number groupings. At that time the chromosome numbers of *L. flexuosa* and *L. tasmanica* were not known but, on anatomical features, the former was placed with species having $2n = 14$, while the latter resembled those with $2n = 18$. The present findings are in accord with the groups defined by these authors and confirm the correlation between chromosomal and anatomical conditions within the genus.

(e) LYGINIA BARBATA. Two, or perhaps three, rather distinctive forms are customarily included under *L. barbata* R. Br. One of these was originally described as *L. imberbis* R. Br. The count cited is of the *barbata* form; an approximate count on material of the *imberbis* form showed a similar level of chromosome number.

(f) HYPOLAENA. Despite the cytological difference, the two species counted appear very close in morphological and anatomical features. In addition to the counts cited, an approximate count shows a lower number, $2n =$ ca. 54 in *H. fastigiata* from West Montagu, Tasmania. The species shows some morphological variation, but, on present information, this cannot be correlated with the cytological findings.

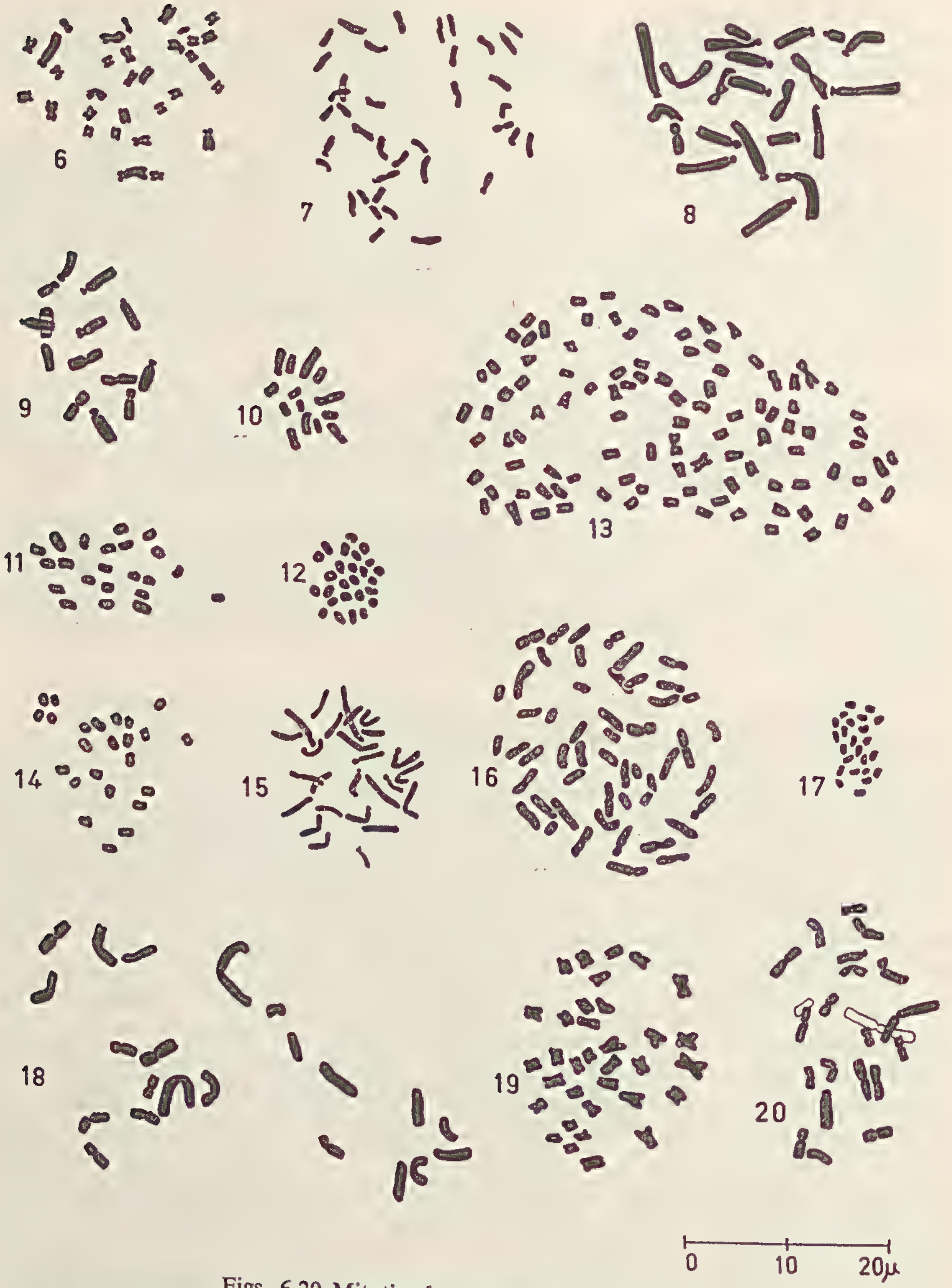
(g) LOXOCARYA. This genus is somewhat heterogeneous anatomically as well as cytologically and clearly needs further study.

(h) CENTROLEPIS. The number found in *C. fascicularis* differs from those reported in other species of *Centrolepis: C. strigosa* Roem. et Schult. $2n = 20$ and *C. aristata* (R. Br.) Roem. et Schult. $2n =$ ca. 46–48 (Hamann 1960), *C. cambodiana* Hance $2n = 40$–42 (Larsen 1963). According to Hou (1957) *C. cambodiana* is close to *C. fascicularis* rather than to *C. strigosa.* Larsen suggests "that the original basic number is $x = 10$ or even 5"; however, the available cytological information is too scanty and too diverse to provide an adequate basis for speculation.

(i) XYRIS. The species counted include members of two of the sections of the genus (Malme 1930), *X. complanata* and *X. juncea* belonging to Section *Xyris*, the remaining species being members of Section *Pomatoxyris.* Previous counts all concern Section *Xyris* where there are reports of $n = 9$ in five North American species (Lewis 1961, Lewis et al. 1962), and of $2n = 34$ in *X. capensis* Thunb. var. *schoenoides* (Mart.) Nilss. from Thailand (Larsen 1963). Present findings render less probable the explanation put forward by Larsen, i.e. that $x = 17$ may have arisen as a secondary base number from ancestors with basic numbers of 8 and 9, the occurrence of species with the former number being unproven.

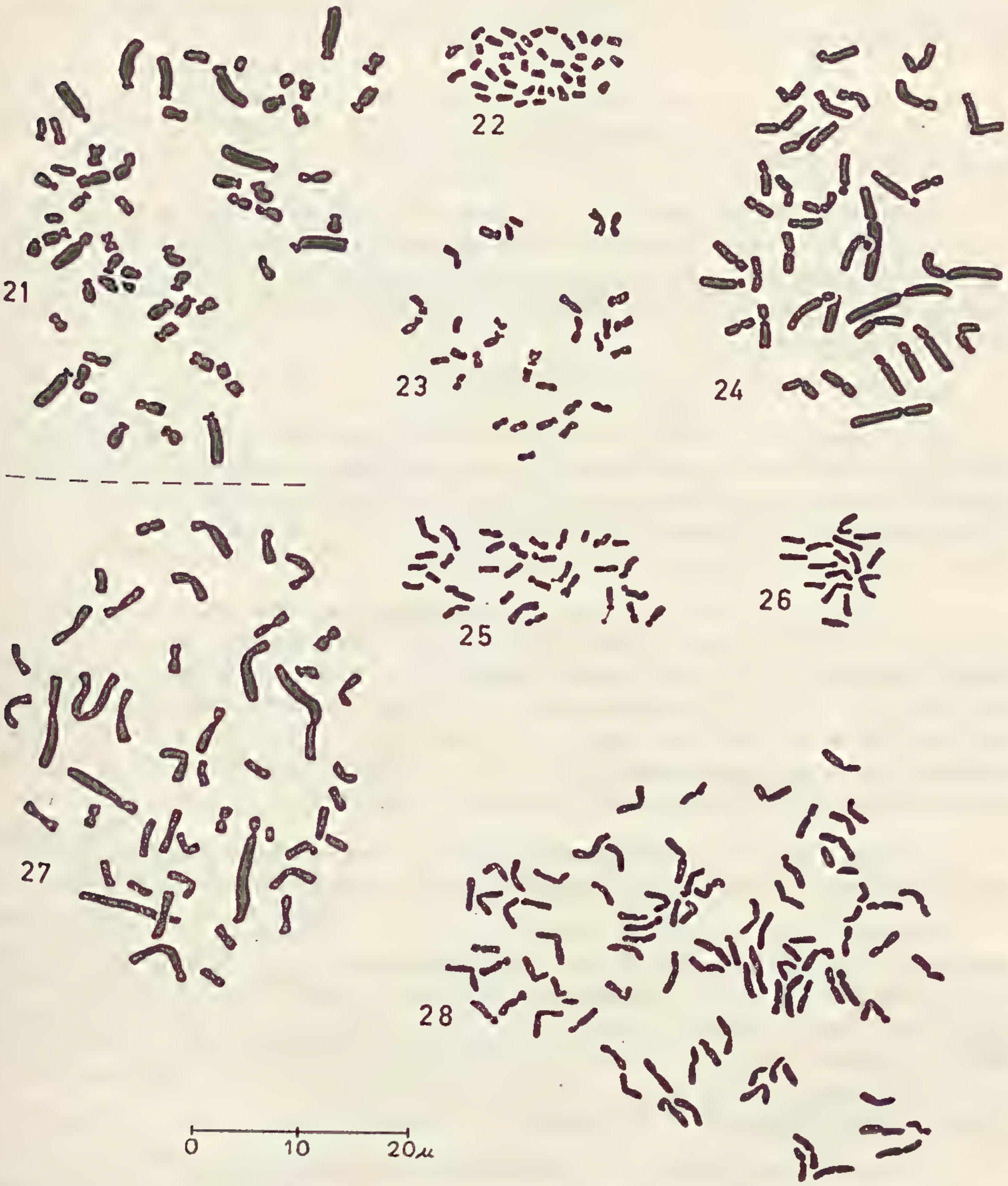
The occurrence of $x = 13$ in two of the sections (which appear to be well defined) suggests that it may be the basic number of the family. Other possibilities would imply the parallel development of this number in two evolutionary lines. Section *Nematopus*, of South America, remains cytologically unknown.

Xyris sp. A and *X. muelleri* are discussed by Evans (1965). The former shows close relationship to *X. gracilis*, while *X. muelleri* is easily recognised by the acuminate bracts at the base of the inflorescence.



Figs. 6-20 Mitotic chromosomes, × 1250.

6. *Triglochin procera* 2n = 32
7. *Flagellaria indica* 2n = 38
8. *Anarthria prolifera* 2n = 22
9. *Lyginia barbata* 2n = 14
10. *Lepyrodia flexuosa* 2n = 14
11. *Leptocarpus tenax* 2n = 22
12. *Hypolaena exsulca* 2n = 26
13. *Loxocarya fasciculata* 2n = 102-104
14. *Calorophus minor* 2n = 24
15. *Xyris juncea* 2n = 26
16. *Xyris complanata* 2n = 52
17. *Lepidobolus drapetocoleus* 2n = 24
18. *Xanthorrhoea resinosa* 2n = 22
19. *Helmholtzia glaberrima* 2n = 34
20. *Xanthorrhoea macronema* 2n = 22



Figs. 21—28 Mitotic chromosomes, × 1250.

21. *Tradescantia albiflora* 2n = 60
22. *Murdannia graminea* 2n = 40
23. *Aneilema acuminatum* 2n = 32
24. *Schelhammera undulata* 2n = 36*
25. *Pollia crispata* 2n = 32
26. *Philydrum lanuginosum* 2n = 16
27. *Doryanthes excelsa* 2n = 48 (late prophase)
28. *Commelina cyanea* 2n = 88

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* Further study, since this paper went to press, indicated that the cell illustrated in Fig. 24 is incorrectly interpreted at two places, largely due to the presence of secondary constrictions. The chromosome number is 2*n* = 36, as given in Table I, rather than as drawn.

(j) Murdannia. The present observation is in agreement with a basic complement of $x = 5$ or $x = 10$. Lewis (1964) indicates that numbers based on such values are predominant in the genus.

(k) Aneilema. In the restricted sense used by recent authors, *Aneilema* seems to be morphologically coherent, but there is evidence of considerable cytological diversity; the six species cited by Lewis (1964) having $2n = 18, 26, 28, 32$ and 60.

(l) Pollia. The genus is little known cytologically, although counts of $2n = 10$ and $2n = 38$ are recorded (Darlington and Wylie 1955). Johnson and Evans (in preparation) outline the reasons for retaining in *Pollia* those species, including *P. crispata* and *P. macrophylla*, which Brückner (1930) treated as a separate genus, *Aclisia* E. Mey.

(m) Count by B. A. Barlow, University of Queensland.

(n) Commelina. Great cytological diversity has been recorded in the genus with all numbers from $n = 11$ to $n = 16$ being represented, together with numerous polyploid derivatives. *C. benghalensis* L. is the only species reported with $n = 11$, or multiples of this number (Lewis 1964). However, *C. cyanea* appears to be closely allied to *C. diffusa* and shows no close relationship to *C. benghalensis*.

(o) Commelina cyanea. The specimens showing the lower level of ploidy are a pubescent form, found much less frequently than glabrous forms. The two localities cited for the former are only three miles apart, while the counts on the latter have been obtained from localities up to three hundred miles apart and from Lord Howe Island. The specimen from Townsville is also a hairy form, but does not fully match any other material in Herb. NSW. Delimitation of taxa in this group is difficult (see Johnson and Evans, in preparation).

(p) Tradescantia. The genus includes a considerable range of polyploid levels, apparently based on $x = 6$, and a wide range of chromosome sizes.

Anderson and Sax (1936) cite a count of $n = 36$ in *T. albiflora*, but these authors also refer to an earlier count by Darlington of $n = 30$ in material named as *T. fluminensis* Vell. These names are not synonymous (Brückner 1927) but the species have been frequently confused, and the identity of the previously counted material is open to doubt. Johnson and Evans (in preparation) point out that the material naturalised and commonly cultivated in Australia has the features which Brückner indicated as characteristic of *T. albiflora*.

Zebrina is closely allied to *Tradescantia* and shares the base number $x = 6$. The chromosomes are many times larger than those of *T. albiflora*, but are comparable in size with those of some of the diploid and tetraploid species of *Tradescantia*.

(q) Helmholtzia. *H. glaberrima* has been referred to a separate genus, *Orthothylax* Skottsb. Discussion of its status will be given by Evans and Johnson (in press), who favour its retention in *Helmholtzia*.

(r) Xanthorrhoea. The stability of chromosome number in *Xanthorrhoea* contrasts with the variety observed in *Lomandra*, on which studies are proceeding. *X. macronema* is morphologically distinctive and shows no intergradation with other species (Lee 1965). It is, however, similar in karyotype to other species investigated, a single large metacentric chromosome pair being conspicuous in all cases.

(s) DORYANTHES. Cave (1964) summarised the various chromosome number reports on the genus and found $n = 24$ in *D. palmeri* W. Hill. *Doryanthes* differs in morphology, anatomy, and cytology from other genera referred to the Agavaceae (Wunderlich 1950, Stebbins and Khush 1961; Cave l.c.) and its inclusion in this family is open to serious doubt.

ACKNOWLEDGMENTS

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I was greatly assisted by many who collected live plants for study, thus making possible a much greater coverage of species than would otherwise have been achieved. For such help I am indebted to Mr R. D. Royce and Mr A. George (State Herbarium of Western Australia), Dr J. S. Beard (King's Park and Botanic Garden, Perth), Mr J. T. Waterhouse (University of New South Wales), Mr E. Volck (Queensland Forestry Department, Atherton), Dr D. Martin and Mr M. Bennett (C.S.I.R.O. Tasmanian Regional Laboratory), Mr E. J. McBarron (Glenfield Veterinary Research Station), Mr H. Brownlee (Department of Agriculture, Sydney), Dr M. D. Tindale, Mr E. F. Constable and Mr A. N. Rodd (National Herbarium of New South Wales), and Mrs P. Messmer.

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Notes on *Xanthorrhoea* in Eastern Australia

ALMA T. LEE

When a preliminary survey of the collections of *Xanthorrhoea* in the National Herbarium of New South Wales was made some years ago, a number of variants from the described species were recognised, but at that time some of them were represented by only a few specimens often deficient in data about many characters. It is a pleasure to acknowledge that this preliminary work by L. A. S. Johnson of this Herbarium, comprising the recognition, sorting and keying out of these variants, has been a valuable aid in the present study. It seemed that increased collections and more detailed information about them would reveal a satisfactory basis for classification as the range of characters of these variants became known. This has to some extent proved true but, on the other hand, the material resulting from an intensive collecting programme has gradually enlarged the known variation within the recognised groups until the previously accepted boundaries disappeared. One by one the " species " were seen to lose their discreteness until only *X. macronema* maintained its distinctness to the degree usually acceptable in a species. This intergradation between species so commonly met with in the genus appears to be due partly to inherent variation correlated with distribution, and partly to hybridism, which breaks down specific distinctions in areas of contact.

In this connection it is of interest that representatives of most of the species have been examined cytologically, and have the same chromosome number, $2n = 22$, including *X. macronema* which is not known to show hybridism.

It is also of interest for future workers that certain phenotypes often show a strong correlation with soil or other habitat characters, and whether the plants have distinct habitat preferences which cause their location or whether the phenotype is a reflection of, i.e. caused by, its habitat is still a question worthy of further investigation.

In population studies of the kind necessitated in this work, reliable conclusions can only be reached with the help of large collections over wide areas, and while it has been possible to acquire greatly increased representation from New South Wales, even here the nature of the plants has in itself been a hindrance. Their flowering period is short and not necessarily an annual occurrence; a young community may give no indication for many years of the potential arborescence of its members; a herbarium specimen, unless annotated carefully, may give no idea of the size of parts nor of the habit of the plant; finally their sheer bulk discourages collectors and herbaria from amassing numerous specimens.

From other States collections available for study were usually quite meagre, and only a few recent sheets bear useful information about the plants from which the specimens were collected. Great value attaches therefore to the help received in obtaining information about Tasmanian and Queensland populations, and I am greatly indebted to Dr D. Martin, Officer in Charge, Tasmanian Regional Laboratory, C.S.I.R.O., who, with several of his colleagues, sent valuable information and many specimens from appropriate parts of Tasmania, and to Mr Lindsay Smith, of the Brisbane Herbarium, who imparted his considerable knowledge of the Queensland populations to me in conversation, thereby clarifying several problems in nomenclature concerning collections from the north of New South Wales.

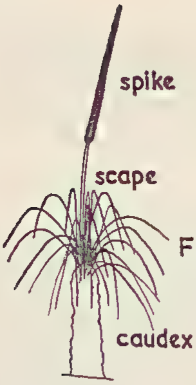


FIG I

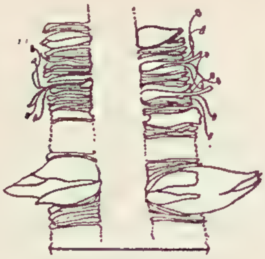


FIG 2

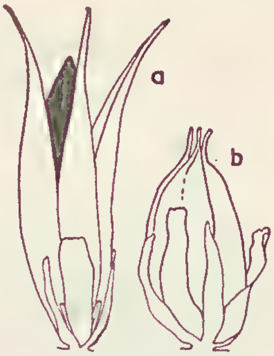


FIG 3

FIG 4

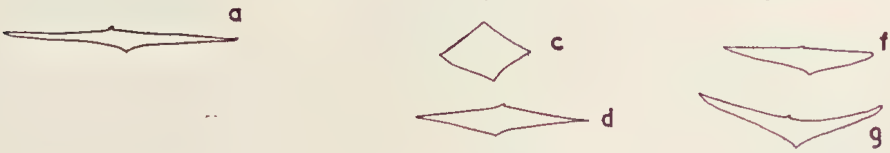


FIG 5

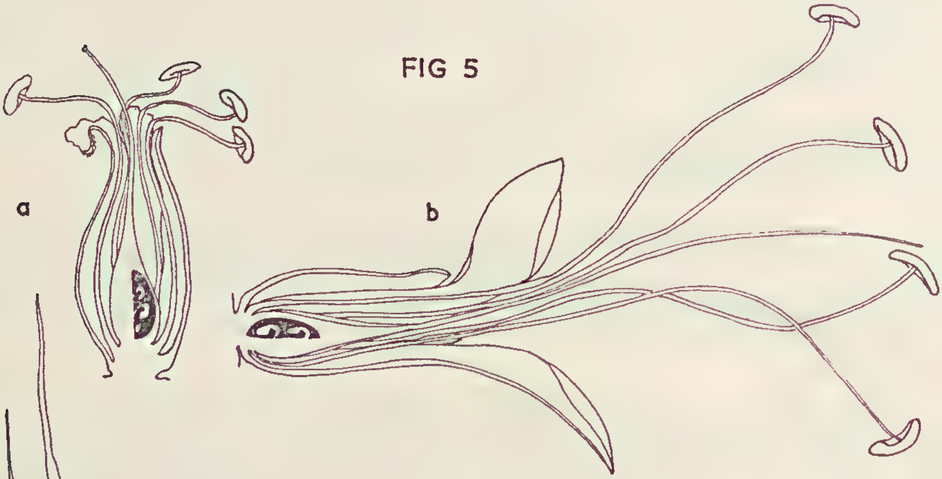


FIG 6

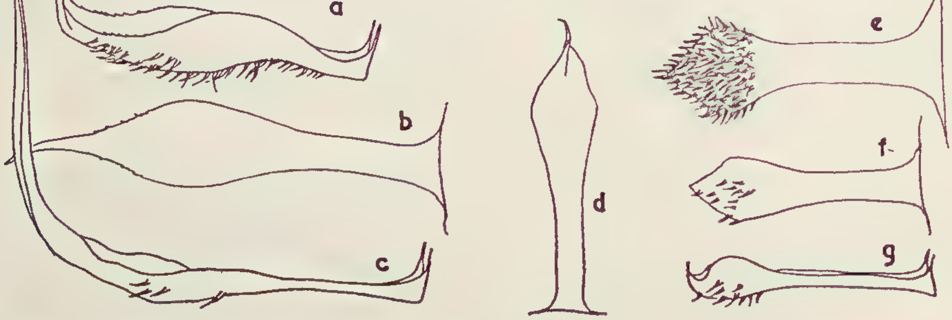


Fig. 1.—Habit (arborescent). Fig. 2.—L. S. Spike, diagrammatic; diameter indicated. Fig. 3.—Fruit: *a.* acute; *b.* obtuse.—Fig. 4.—Leaf shape in section: *a.* flat; *b, c, d,* quadrangular; *e, f, g.* triangular. Fig. 5.—Half flower (× 6): *a. X. media; b. X. macronema.* Fig. 6.—Bract form: *a, c.* Prominent cluster bracts and *b.* long-acute bract (*X. australis*); *d.* intermediate; *e.* short-acute, tomentose bract (*X. resinosa*); *f.* short-acute, subglabrous bract and *g.* obscure cluster bract (*X. media*).

Added to the difficulties of much intergradation and initial lack of material was the problem of discovering any positive diagnostic characters, a difficulty which arose from the fundamental uniformity of the flowering and vegetative parts and led to eventual reliance on indicative rather than absolute differences.

From the complex of uniform or closely intergraded features presented by the specimens examined, the following characters have proved the most useful for diagnosis:—

(i) Habit of the plant (Fig. 1): acauline, or weakly or strongly arborescent. The potential habit of individual plants of arborescent form must sometimes be deduced from that of other plants in the community, because of the slow growth-rates. Plants with caudex up to 75 cm. high are regarded as acauline.

(ii) Shape of the broadest floral bracts and degree of prominence of the cluster bracts, though many intermediate conditions are found. In the following descriptions, bracts are said to be long-acute when the broadest ones are more or less narrow-elliptical and taper gradually into a narrow point, or short-acute when the broadest are oblanceolate to spathulate and narrow abruptly at the apex (see Fig. 6).

(iii) Relative lengths of fully grown spike and scape (Fig. 1): the scape grows first, then the spike shows continued growth over a considerable period.

(iv) Shape of the leaf in section, taken at about the middle (Fig. 4): there appears to be some fundamental difference between the triangular leaf and the quadrangular, though they approach through convexity of the upper surface of the triangular type; both, by decreased thickness, can approach a nearly flat condition. The terms, printed in italics, describing leaf shape in section, are those proposed by the Systematic Association Committee for descriptive Biological Terminology in Taxon XI (1962) 145.

On the basis of these characters, the genus falls into three subdivisions in the eastern States.

(i) The " australis " group: *X. australis* and *X. johnsonii.*

(ii) The " arborea " group: *X. arborea, X. media, X. minor, X. pumilio* and *X. resinosa.*

(iii) *X. macronema.*

The essential differences between these groups are the long-acute bracts, prominent cluster bracts and distinctly quadrangular leaves of *X. australis* contrasted with the short-acute bracts, obscure cluster bracts and flat to triangular or only obscurely quadrangular leaves of the " arborea " group and of *X. macronema* (Figs. 4, 6). *X. johnsonii* has features of both groups but is closer to *X. australis.* These characters are not entirely satisfactory criteria for subdivision of the genus, but after years spent in gaining some familiarity with collected material I have failed to find any which are more reliable for diagnosis.

The many putative hybrid derivatives posed a problem in nomenclatural treatment; rather than overburden common usage with unwieldy formulae, and since they do in fact often represent considerable established populations, they have been here classified with the parent species which they resemble more in habit, their apparent derivation being mentioned in the text, and the particular specimens indicated in the citations.

The present paper is intended to provide a general picture of the genus in New South Wales and neighbouring States, to stabilise nomenclature of species whose Types have been lost, and to publish names of new taxa, prior to publication of a more detailed taxonomic treatment in the Flora of New South Wales.

In the text below, synonymy and references are omitted, and distribution of taxa is given only in general terms for New South Wales, since detailed synonymy and citation of specimens from this State will soon appear in the Flora of New South Wales; conversely distribution in other States is given in terms of cited specimens since these will not be included in that Flora. Specimens cited have been examined unless otherwise stated.

THE POPULATIONS OF EASTERN AUSTRALIA AND THEIR DISTRIBUTION

X. macronema is the only one of the eastern species of *Xanthorrhoea* which completely maintains its distinctness (see Fig. 7), with differences in leaf section,

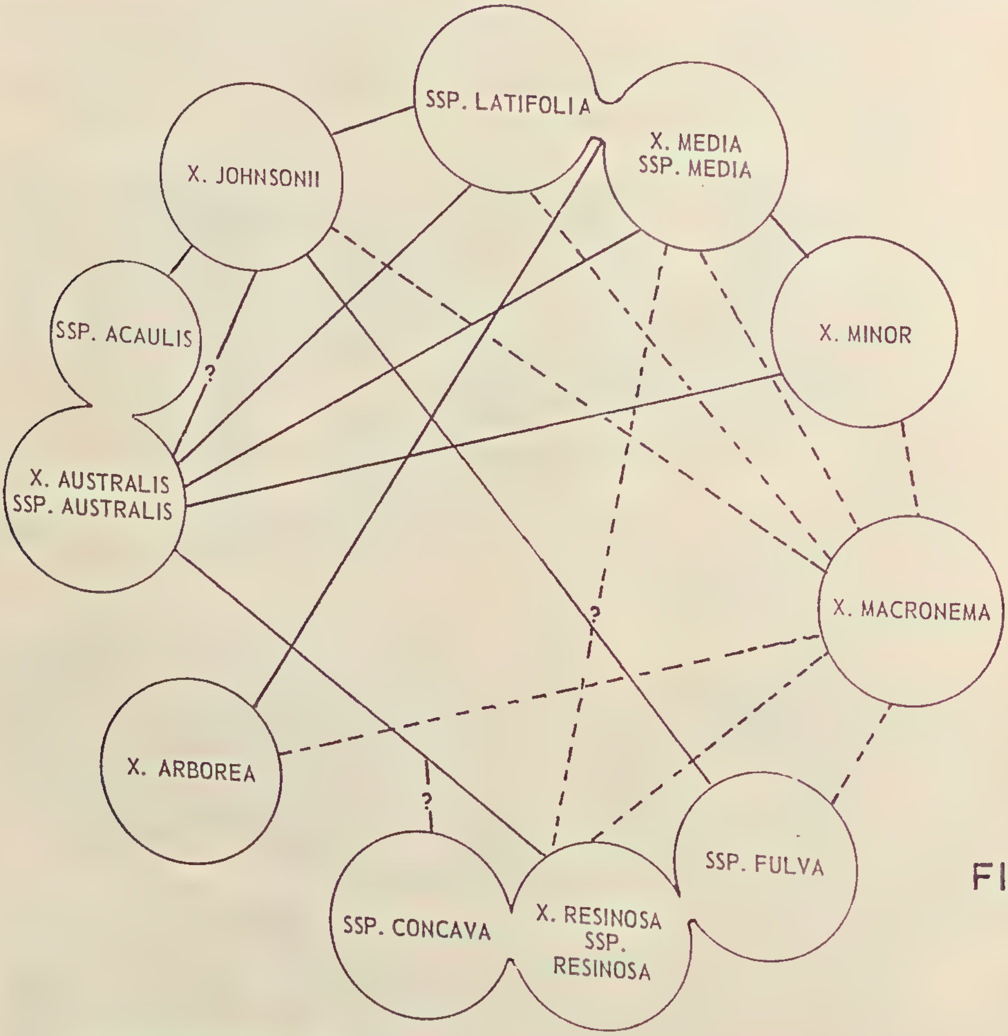


FIG 7

Fig. 7.—Solid lines join taxa between which putative hybrid derivatives have been found. Broken lines join taxa which occur in one area apparently without hybridism.

flower (Fig. 5, b) and fruit. It occurs from the Central Coast of New South Wales to the coast of southern Queensland where it is known from as far north as Fraser Island (Map 5). *X. pumilio*, which has not been studied, appears to be a miniature species known only from the Port Curtis district of Queensland.

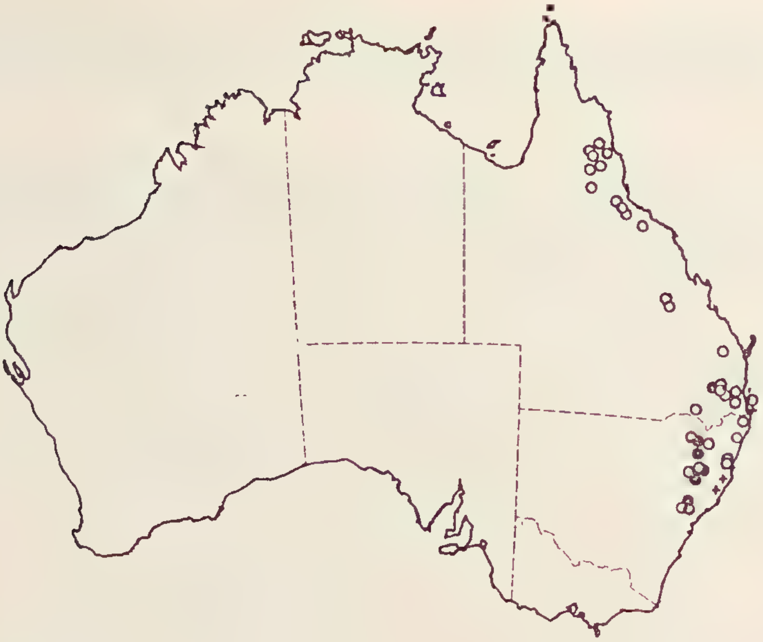
Of the other species only *X. johnsonii* and *X. australis* occur on the inland side of the Great Dividing Range or of the coastal ranges of Queensland (Maps 1, 2). *X. johnsonii* is most closely related to the isolated *X. thorntonii* of Central Australia and to *X. quadrangulata* of South Australia, and indeed a few of its representatives could not be separated morphologically from those species, though the vast distances between and the variation shown justify their recognition as allopatric species. *X. australis* is also related to the group through *X. johnsonii*, and if a Central Australian origin were hypothesised, *X. thorntonii* and *X. johnsonii* would be the northern derivates and *X. australis* the southern from this stock.

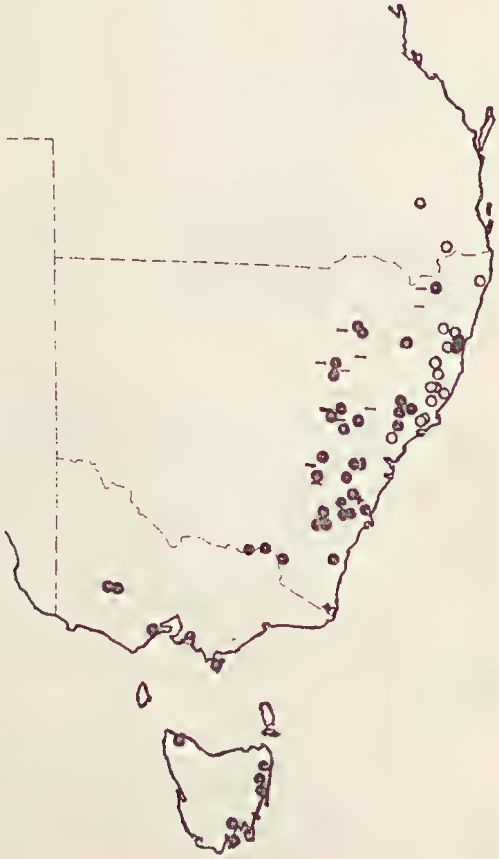
X. johnsonii occurs only in Queensland and northern New South Wales, *X. australis* in New South Wales, Victoria, South Australia and Tasmania and, in hybrid form only, in Queensland. Both reach the eastern coast of the continent but this is exceptional (apparently by way of river valleys) in *X. australis.* It is improbable that *X. australis* and *X. johnsonii* fail to hybridise in their common territory in northern New South Wales, but it is also possible that the two occupy fairly rigidly distinct habitats so that opportunity is restricted, though both are found on igneous or metamorphic soils. As circumscribed here their distinction rests ultimately on only the bract and cluster bract form, but this tends to divide the specimens into groups with supporting features and may prove to be a good diagnostic character. Perhaps in response to soil or climatic effects, *X. australis* shows a variant in the west of its range in New South Wales (ssp. *acaulis*); *X. johnsonii* may require subdivision when better known.

Hybrid derivatives presumably from *X. johnsonii* and *X. resinosa* ssp. *fulva* occur on the North Coast of New South Wales and on Stradbroke Island, Queensland (see *X. johnsonii*), and such derivatives from *X. johnsonii* and *X. media* ssp. *latifolia* occur and are probably quite common in coastal Queensland and north coastal New South Wales, though the two species seem to occur in pure communities related to different habitat conditions (see *X. media*).

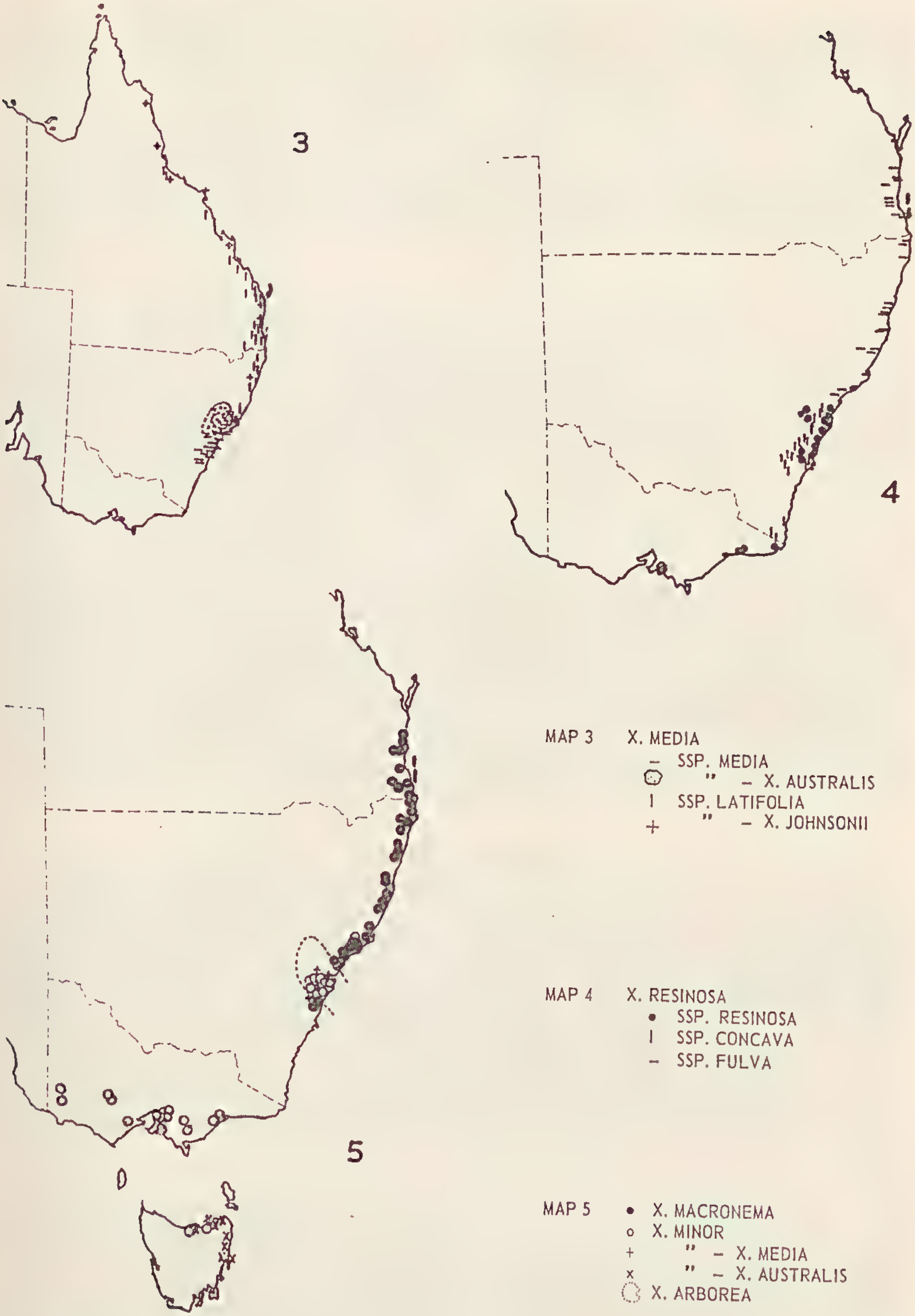
X. australis (q. v.), with *X. media* ssp. *latifolia*, is almost certainly the source of extensive populations presumably of hybrid derivation in ranges of the North Coast of New South Wales and of southern Queensland, and also, with *X. media* ssp. *media*, of a slightly different population where *X. australis* and *X. media* ssp. *media* (and also *X. johnsonii*) approximate south of the Hunter and Goulburn Rivers in New South Wales (see *X. media* ssp. *media*). Two recent collections have revealed evidence of further hybridism in *X. australis*, this time with *X. resinosa* ssp. *resinosa*, in the South Coast of New South Wales (see *X. australis* ssp. *australis*), while there are a number of specimens from Tasmania which suggest that hybridism has occurred there between *X. australis* and the now much diminished population of *X. minor* (q. v.).

The species of the " arborea " group are, in fact, only the foci of a widely distributed coastal population, distinct enough at the extremes of variation but closely integrated in many places, in which morphology (see representative flower, Fig. 5, a) and habitat are often closely correlated, either as cause or effect. The four species are related as follows:—*X. minor:* acauline, the smallest in inflorescence, and most southerly in range occurring from Tasmania and South Australia to





Maps 1–2.—Distribution Maps for Eastern Species of *Xanthorrhoea.* Formulae in keys to the maps, such as *X. johnsonii–X. australis*, indicate hybrid derivatives from these taxa.



Maps 3–5.—Distribution Maps for Eastern Species of *Xanthorrhoea*. Formulae in keys to the maps, such as *X. minor–X. media*, indicate hybrid derivatives from these taxa.

about Port Stephens in New South Wales; *X. resinosa:* acauline, as small to much larger in inflorescence, with tomentose bracts, and extending from eastern Victoria northwards into southern Queensland; *X. media* ssp. *media:* acauline, similar in size to the larger *X. resinosa* but with near-glabrous bracts, occurring only in the Central Coast of New South Wales; *X. arborea:* arborescent, the largest in inflorescence, with a limited distribution near *X. media* ssp. *media*, and these two apparently merging (perhaps also with *X. minor*) in a northern population, *X. media* ssp. *latifolia:* acauline to weakly arborescent, varying in inflorescence size, and extending from about Wyong, N.S.W., to the northern coast of Queensland (Maps 3, 4, 5).

In Tasmania, early botanists recorded large areas occupied by *X. minor* in the north of the island (J. D. Hooker, Fl. Tas. II (1857) 59) but today it seems to be scarce, probably due to the clearing and cultivation of much of this country. *X. australis*, on the other hand, is widespread along the north and east of Tasmania. A number of recently collected specimens, representative of present day populations, strongly suggest hybridism, even allowing for the considerable inherent variation in *X. australis*, but as *X. minor* becomes more and more depleted it would not be surprising if populations of hybrid derivation by backcrossing came to show more and more of the "australis" character (see description under *X. minor*). In Victoria, *X. minor* extends from the South Australian to the New South Wales border, chiefly in the coastal fringe, and though it is not yet known from the South Coast of New South Wales it appears again in the Sydney Basin, chiefly on the heavier clay or lateritic soils. Its distinction from *X. media* rests mainly on size of inflorescence but a community at Monkeyjacket, near Port Stephens, contains examples of all sizes between the two, and there are a number of other instances of plants with intermediate characters (see *X. minor*). Possible "phantom" hybridism with *X. australis* apparently occurred earlier in the Parramatta district (see *X. bracteata*, under *X. minor*) producing plants like the Tasmanian putative hybrids, but no *X. australis* has ever been recorded from near Parramatta.

X. resinosa is at once distinguished from the other species by its tomentose bract tips; it is usually to be found on soils with fairly abundant ground water, and is more tolerant than other species of swampy conditions. This distinction, however, tends to obscure its close relationship with *X. media*, though Brown, in his original description (as *X. hastile*) remarked "perhaps too close to *X. media*". The two species may be found in the one area, but usually in different habitats of that area, *X. resinosa* in the wetter, *X. media* in the drier parts. Nevertheless I have seen *X. media* ssp. *media* growing in a typical *X. resinosa* habitat (at Bateau Bay near The Entrance, NSW 61297) and here, except for the tomentose bract tips, it was very close to *X. resinosa* morphologically. I do not know of them growing mixed in a community, but differences in flowering time could obscure such an occurrence.

X. resinosa reaches its most southerly point in north-eastern Victoria and extends, chiefly along the coastal strip, into southern Queensland as far as the Noosa River and also into the eastern part of the South and Central Tablelands of New South Wales, three subspecific populations being recognisable (Map 4). Apart from its relationship with *X. media*, *X. resinosa* shows apparent hybridism with *X. johnsonii* and *X. australis* as mentioned under these species above.

X. media is not known from as far south as *X. resinosa*, appearing first in the Central Coast of New South Wales bordering on the Tablelands near Picton. Here and in the Sydney area (the Type locality) it is often found on the dry rocky ridges of the Hawkesbury Sandstone and in these conditions flowering may be very infrequent. These communities are usually clearly distinguished from the freer flowering *X. arborea*, which grows in the same areas but in more sheltered habitats, and there appear to be few individuals which present any difficulties in identification. North of the Hawkesbury River, however, these populations are replaced by one (*X. media* ssp. *latifolia*) which combines their characters and lacks the correlation of leaf width, inflorescence size and habit which distinguish the two species further south. Indeed, the three characters which are diagnostic in the south become more or less intermediate in the northern population in which still other characters may have been derived from *X. arborea* (e.g. its free-flowering nature) or from *X. media* (e.g. its bright green glossy leaves and high scape to spike ratio, often 2: 1 or 3: 1). It is interesting too that *X. minor* reaches its most northerly point in the area where this replacement population (for *X. media* ssp. *media* and *X. arborea*) appears, and that hybridism occurs here between *X. media* and *X. minor*, so that *X. minor* too may be involved in a stock from which the three species are separated in the south (Maps 3, 5).

Apart from this integration with other species of the " arborea " group, presumed hybridism of certain *X. media* populations with *X. australis* and with *X. johnsonii* are mentioned under those species above.

From these observations on the populations as presently represented in our collections, a classification proposed at present cannot profess to be conclusive, and some of the taxa described below are given their rank more to accord with existing practice than from any conviction that it reflects their true biological status. Unfortunately these plants do not conveniently lend themselves to experimental investigation owing to their slow rate of growth and sometimes infrequent flowering. Nevertheless collecting must obviously be continued, and must be supported by descriptive notes on the size and habit of the specimen and its parts and of others in its community of origin.

Xanthorrhoea Smith

TYPE SPECIES: *Xanthorrhoea resinosa* Pers.

The genus *Xanthorrhoea* was originally described by J. E. Smith (Trans. Linn. Soc. Lond. IV (1798) 219) who cited its source only as " Locus Australasia ". Later Persoon (Syn. Pl. I (1805) 370) gave Smith's description almost verbatim when describing *X. resinosa*, and it is apparent that both descriptions are based on the same specimen and that Persoon's species is the Type species of the genus.†

In 1810 Robert Brown (Prodr. (1810) 288) described *X. hastile* from Port Jackson and distinguished six other species in the previously monotypic genus. Brown did not refer to Persoon's publication of *X. resinosa*, and because of the full and satisfactory treatment of the genus in the Prodromus, Brown's names were taken up in subsequent works and Persoon's neglected or relegated to synonymy.

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† Earlier, Smith had published an account in English of the "Yellow Resin Tree" collected by Dr White at Port Jackson or Botany Bay which, though invalid, has caused some confusion in the nomenclature (Appendix to White, Journal of a Voyage to New South Wales pp. 235-6 and 249, Plate A; plates printed 29.12.1789 but volume published 1790); the specimens on which this account was based comprised only pieces of caudex with some leaf bases of *Xanthorrhoea* but the description mentioned a trunk of 14 or 16 ft., and this phrase must apply to *X. arborea* R. Br., since it was the only species in the area then explored with a caudex approaching these dimensions though never seen at this height today. Because of this, Moore & Betche (Hand. Fl. N.S.W. (1893) 425) and Maiden & Betche (Census N.S.W. Pl. (1916) 42) cited *X. arborea* as a synonym for *X. resinosa*.

Thus in 1819 Smith wrote an account of the species of *Xanthorrhoea* in Rees's Cyclopedia, using Brown's names and translations of Brown's descriptions. Under *X. hastile* he added that this species was his " Yellow Resin Tree " of 1790, attributing the mention there of a tall caudex to confusion of two species (*X. arborea* and *X. hastile*) by his informant, Dr White. He also implied in his original description of *Xanthorrhoea* that the Yellow Resin Tree was the basis of his genus (i.e. *X. resinosa*) by the words " caudex . . . resina flava scatens ", other species exuding reddish coloured resin. Thus he indicated that *X. hastile* R. Br. was synonymous with *X. resinosa* Pers., and this implication has been accepted and reiterated by Kunth (Enum. Pl. IV (1843) 649), W. J. Hooker (Bot. Mag. LXXIX (1853) 4722) and recently by Bullock (Kew Bull. XIV (1960) 45), though only the last has taken up *X. resinosa* and reduced *X. hastile* to synonymy. Because of the possibility of error in determination of plants then so little known and so similar, and the prevalence of *X. media* rather than *X. resinosa* in the immediate vicinity of Sydney Cove, Port Jackson, in 1790, an effort was recently made to locate Smith's original specimen both at the Linnean Society of London, and at the Rijksherbarium, Leiden. No appropriate specimen could be found, however, and Smith's testimony must be accepted. It has also been suggested by Dr F. A. Stafleu (p.c.) that Smith's publication in Rees's Cyclopedia might be regarded as a first designation of Lectotype.

1. **Xanthorrhoea resinosa** *Pers.*, Syn. Pl. I (1805) 370.

HOLOTYPE: Port Jackson, or Botany Bay, J. White, 1788 apparently lost; see notes above. NEOTYPE, here designated: *New South Wales:* Centennial Park, E. F. Constable 6.7.1962 (NSW 57853).

X. resinosa is an acauline species, the caudex attaining a height of only a few inches, with spikes which are nearly always shorter than the often tall scapes, short-acute, densely tomentose bracts (Fig 6, e) and obscure cluster bracts, and obtuse fruits (Fig. 3, b). Presumed hybridism occurs in two subspecies.

DISTRIBUTION (Map 4): *X. resinosa* occurs in eastern States from Victoria to Queensland; there are two coastal variants, ssp. *resinosa* in the south and ssp. *fulva* in the north, and a third, ssp. *concava*, which occurs on the Southern and Central Tablelands of New South Wales and in coastal highlands near Sydney.

The species has usually been known by its synonym *X. hastile*, but both this name and *X. resinosa* have been misapplied (see ssp. *resinosa* below).

a. **X. resinosa** ssp. **resinosa.**

EQUIVALENT SYNONYM: *X. hastile* R. Br., Prodr. (1810) 288; Holotype lost from BM due to war damage: Port Jackson, R. Brown, Iter Austral. 1802-5; NEOTYPE, here designated: as for *X. resinosa.*

The Type subspecies is characterised by rather thick leaves, triangular or quadrangular in section, mostly about 3–3.5 mm. broad, and by its dark brown, often stout spikes, shorter than or equal to their scape (except in a few specimens from the Blue Mountains where spikes exceed scapes). Presumed hybrids derived from this subspecies and *X. australis* ssp. *australis* are described under the latter, below.

DISTRIBUTION (Map 4): Coastal localities from Gippsland, Victoria, to Central New South Wales and the Blue Mountains, with hybrid derivatives from *X. australis* ssp. *australis* in the South Coast of New South Wales.

VICTORIA: Mallacoota, Williamson 1.1920 (MEL); Ti Tree Creek to Orbost, Sayer 1887 (MEL); Coast E of Marlo, Snowy R., per James & Co. 11.1915 and 1.1916 (MEL).

The species described or listed as *X. resinosa* by Moore & Betche in Handb. Fl. N.S.W. (1893) 425 and Maiden & Betche in Census N.S.W. Pl. (1916) 42 is in fact *X. arborea*, which is a quite distinct species.

The species described under *X. hastile* by J. D. Hooker in Fl. Tas. II (1860) 59, quoting a manuscript of Gunn, is *X. australis* ssp. *australis.*

b. **Xanthorrhoea resinosa** ssp. **fulva** *Lee*, **ssp. nov.**

HOLOTYPE: *New South Wales:* Coff's Harbour, E. F. Constable 17.10.1961 (NSW 61664).

A Typo conspectu pallidiore spicarum saepe gracilliorum, a pilis pallidis in bracteis, et foliis gracillioribus saepe supra planis concavisve differt. Folia 1.5–3.5, often 2–3, mm. lata; scapus gracilis plerumque 6–9 mm. (–19 mm.) diametro, 20–60 (–160) cm. longus; spica 12–20 (–29) mm. diametro, 5–60 (–90) cm. longa.

Differs from the Type in its often more slender, pale brown, greyish or fawn coloured spikes (from the pale or colourless hairs on light-brown coloured bracts), becoming darker only in fruit and then chiefly from the decay of stamens and perianth, and in its more slender and less rigid leaves, often flat or concave on the upper surface. Leaves *very depressed-obtriangular* in section or sometimes concave above 1.5–3.5, often 2–3, mm. broad; scape slender, 6–19, usually 7–9, mm. in diameter, 20–160, usually 20–60, cm. long, often finely wrinkled; spikes 12–29, usually 12–20, mm. in diameter and 5–90, usually 10–60, cm. long. Presumed hybrids derived from this subspecies and *X. johnsonii* are described under the latter.

DISTRIBUTION (Map 4): North Coast of New South Wales, and South Coast of Queensland, with hybrid derivatives from *X. johnsonii* (q. v.) in the North Coast, New South Wales, and on Stradbroke Island, Queensland.

QUEENSLAND: Coondoo Creek, NW of Mt. Coondoo, Francis 12.1919 (BRI 029103); Noosa R., White 3.1923 (BRI 029104); Coolum Beach (BRI 029095); Burun, Leichhardt 12.1843 (MEL); Beerwah, Francis 11.1919 (BRI 029101); Beerburrum Creek, Constable 5.1962 (NSW 61663); Rose Creek between Elimbah and Beerburrum, Johnson 5. 1961 (NSW 56782); Moreton Bay, Stuart (MEL); Stradbroke Island, Bick 4.1915 (BRI 029105); Russell Island, White 9.1913 (BRI 029097); without locality (BRI 029098).

c. **Xanthorrhoea resinosa** ssp. **concava** *Lee*, **ssp. nov.**

HOLOTYPE: *New South Wales:* 1 mile W of Buxton, A. Lee 5.12.1960 (NSW 61300).

A Typo foliis latioribus planioribusque in sectione *concavo-perdepresse obtriangularibus,* et saepe spicis primo pallidis differt. A ssp. *fulva* foliis rigidis latisque, et spicis scapisque longioribus differt. Folia 3–6.5, saepe 3.5, mm. lata, dura; spica 15–150, plerumque 50–90, cm. longa, ca. 20 mm. diametro; scapus levis, 50–250, plerumque 100–200, cm. longa, ca. 10 mm. diametro.

Differs from the Type in its broader, flattish to concave, bluish-green leaves, and often in the pale greyish aspect of the young spikes. The more rigid leaf character and usually stouter spikes and scapes distinguish it from ssp. *fulva.* Leaves slightly concave above, *very depressed obtriangular* in section, 3.5–6.5, usually 3.5, mm. broad, very firm in texture; spikes shorter than their scapes, 15–150, usually 50–90, cm. long and 12–30 mm. in diameter; scapes smooth or nearly so, 50–250, mostly 100–200, cm. long, about 10 mm. in diameter.

DISTRIBUTION (Map 4): Chiefly on the Central and Southern Tablelands of New South Wales, also in the highlands of the Central and South Coast divisions.

2. **Xanthorrhoea minor** *R. Br.*, Prodr. (1810) 288.

Holotype: Port Jackson, R. Brown, Iter Austral. No. 5773, 1803 (BM); photograph only seen, specimen examined and reported on by Hj. Eichler, Australian Liaison Officer at Kew, 1962.

Equivalent Synonym: *X. bracteata* R. Brown., loc. cit. Holotype: Port Jackson, R. Brown, Iter Austral. No. 5772, 1803 (BM); photograph of specimen and enlargement of bracts seen, the specimen examined and reported on as for *X. minor*. This sheet bears a field label "Port Jackson or Fort Dalrymple", localities in New South Wales and Tasmania respectively, though cited in the Prodromus as from Port Jackson. The specimen, now very imperfect, resembles *X. minor* in the size of scape and spike, the leaf section and the (described) acauline habit, and though according to the description its cluster bracts, now mostly missing, were of the prominent "australis" type, the bracts shown by the specimen are intermediate in shape and of a form not uncommon in *X. minor*. The affinities of *X. bracteata* thus seem to be with that species which is recorded from both the possible localities rather than with *X. australis* which is not known from Brown's " Port Jackson ".

An interesting collection of several spikes and detached leaves (Parramatta, Woolls (MEL)) includes one spike with well-developed prominent cluster bracts together with others of normal *X. minor* and of young, scarcely determinate character. Possibly Brown's specimen was from a similar plant from this locality, but such occurrences are rare and have not been collected since, though we have a slightly larger spike which is comparable from Wyong (NSW 59851), but relevant details of its habit and exact locality are not known. Alternatively it might have been one of the putative hybrid derivatives from *X. minor* and *X. australis* still to be found in Tasmania. In the absence of supporting collections, it is considered that *X. bracteata* is best treated as conspecific with *X. minor*.

X. minor is an acauline species with a usually much-branched subterranean caudex which at flowering produces a number of spikes from the branches. It has triangular leaves, often concave above, about 2–2.5 mm. broad and 1 mm. thick, very small spikes, often 5–12 cm. long and about 5–10 mm. in diameter, on slender scapes 25–50 cm. long and only 2–5 mm. in diameter and smooth to quite strongly wrinkled, short-acute to intermediate bracts and obscure or sometimes slightly prominent cluster bracts. The flowers are larger than those usually seen in other species (except *X. macronema*) but this is not a satisfactory diagnostic character. Presumed hybrid derivatives from *X. minor* and *X. australis* ssp. *australis* show various combinations of the features of the two species, and some of these may come within the range of variation in *X. australis*, but others with relatively broad (ca. 3 mm.) near-triangular leaves, or short, slender spikes (ca. 2 cm. diam.) not longer than their scapes, and/or little prominence of the cluster bracts, are strongly suggestive of hybridism between these species. Intergradants in size of inflorescence between *X. minor* and *X. media* are presumably of hybrid derivation from those species.

Distribution (Map 5): New South Wales, usually on clay soils of the Central Coast from near Sydney to Port Stephens, and in Victoria, †South Australia and northern Tasmania, with hybrid derivatives from *X. australis* ssp. *australis* in Tasmania, marked * in the citations below, and others intergradant towards *X. media* ssp. *media* in the Central Coast of New South Wales, mostly between the Hawkesbury–Nepean and George's Rivers.

Victoria: Hanson S, Black 11.1936 (MEL); between Mt. Nevis & Mt. Cole, Green (MEL); Creswick, Willis 1.1958 (MEL); Linton, Williamson (MEL); Warburton, White 11.1927 (BRI 029167); Woori Tallock, 12.1905 (MEL); Ringwood, Muir Nos. 2003 and 2004, 12.1960 (MEL); Bayswater, 11.1900 (MEL); Dandenong Ra., 1.1883 (MEL); Fumina R., Williamson No. 214, 2.1925 (MEL); Sandringham, 11.1898 (MEL); Glenelg R., Mueller 2.1878 (MEL);

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† No specimens have been seen, but J. B. Cleland (p.c. 7.1965) has described typical *X. minor* from the eastern side of the Murray River in South Australia.

Port Phillip (MEL); Mitchell's R., Lake Tyers, Lake Wellington, 4.1878 (MEL); Thomson R., Tisdall 1882 (MEL); Cheltenham, Cowle (MEL); 8 miles W of Mumbannar, Tindale 3.1963 (NSW 63207); 1 mile W of Dartmoor, Tindale 3.1963 (NSW 63206); Upper Yarra, Staer 4.1911 (NSW 59881); Brighton, Morrison No. 330, 1892 (NSW 59880); Mornington, Weindorfer 11.1902 (MEL); Frankston, 12.1905 (MEL).

TASMANIA: Cape Portland, Rodway 1.1951 (NSW 61296 "B")*; S. Croppies Pt., 3 miles inland, Honeysett 12.1964 (NSW 77854)* and Honeysett 12.1964 (NSW 77853)*; Waterhouse, Bennett 11.1964 (NSW 77824); Bridwood Gate, Bennett 12.1964 (NSW 72395*, 72397*); ½ mile W of Bridport, 12.1964 (NSW 72396); Tam o' Shanter Bay, W of Weymouth, Bennett 11.1964 (NSW 72129, chromosome count voucher)*; York Town, Gunn No. 764, 1.1843 (NSW 59883); Scamander, Rodway 10.1933 (NSW 61348)*; Elephant Pass near St. Mary's, Olsen 8.1963 (NSW 66319)*; near Coles Bay, Wolfe No. 6, 10.1962 (NSW 66043)*; road to Coles Bay, McDougall 1.1962 (NSW 61297)*.

The specimens from Queensland cited under *X. bracteata* by Bentham (Fl. Austral. VII (1878) 116) are not conspecific with *X. bracteata* nor with *X. minor*, but their affinities are doubtful. Those from Newcastle Ra., F. Mueller, and Whitsunday Is., Henne are at MEL but very imperfect; the former probably belongs to *X. johnsonii*, the latter to *X. media*. The Springsure specimen, if like " coll. Wuth " (MEL), may also belong to *X. johnsonii*. The description under *X. bracteata* by Bailey (Qld. Fl. V (1902) 1665) is mixed and appears to be partly derived from *X. johnsonii*, and Bailey's description under *X. minor* (ibid. p. 1664) may be derived from *X. media*, or partly at least from *X. johnsonii*.

3. **Xanthorrhoea media** *R. Br.*, Prodr. (1810) 288.

HOLOTYPE: Port Jackson, R. Brown; lost from BM.

NEOTYPE, here designated: *New South Wales:* Parramatta, J. H. Camfield 11.1897 (NSW 59863).

X. media is characterised by an acauline or weakly arborescent habit, glabrous, near-glabrous or shortly ciliate, short-acute to intermediate bracts, and obscure cluster bracts scarcely exceeding or upturned beyond the spike surface (Fig. 6, f and g), glossy green leaves, and inflorescences (see half-flower, Fig. 5, a) very variable in size with the dark brown spike shorter than the scape. Presumed hybrid populations are formed by both subspecies (q.v.).

DISTRIBUTION (Map 3): *X. media* extends from the Central Coast of New South Wales and Blue Mountains, to coastal Queensland at least as far north as Townsville; two subspecies may be recognised: ssp. *media* in the southern and ssp. *latifolia* in the northern part of the specific range, the change occurring in the area between the Hawkesbury and Hunter Rivers.

Since its original description, *X. media* is rarely named in the literature though it is a common plant in the areas treated by Bentham, Mueller, Bailey and Moore & Betche. Its resemblance to *X. resinosa*, *X. johnsonii*, *X. arborea* and *X. minor* may have led to confusion with these species, but available cited specimens leave the interpretations of these botanists largely speculative.

a. **Xanthorrhoea media** ssp. **media**.

Acauline plants with narrow, glossy green leaves, usually 3 mm. or less in breadth, triangular to quadrangular in section, spikes 30–80 cm. long and 23–28 mm. in diameter, or 70–140 cm. long and 17–40 mm. in diameter in the most southern specimens which border on the Tablelands, and scapes distinctly longer, 90–200 cm. long and 8–12 mm. in diameter or up to 27 mm. in the thickest inflorescences. Presumed hybrid derivatives from this subspecies and *X. australis* ssp. *australis* usually show a tendency to arborescence, a slight prominence of the cluster bracts all over the spike, and a quadrangular though sometimes thin leaf section, while other hybrid derivatives from *X. minor* (q.v.) are also known.

Distribution (Map 3): From the border of the Central Tablelands near Picton, N.S.W., and the Blue Mountains to the coast as far north as Wyong, occasionally in coastal flats but more commonly on higher ground, with a population of hybrid derivatives from *X. minor* (q.v.) in the western and south-western outskirts of Sydney, and others from *X. australis* ssp. *australis* on the slopes and ridges above the Goulburn, middle Hunter and Macdonald Rivers. This latter population, which is close to *X. media* in habit, approaches very closely a few specimens which occur further north-west, outside the *X. media* boundaries, and chiefly for that reason supposed to be hybrid derivatives from *X. johnsonii* (q.v.) and X. *australis* ssp. *australis*.

b. **Xanthorrhoea media** ssp. **latifolia** *Lee*, **ssp. nov.**

Holotype: *Queensland:* Beerwah, Constable 5.1962 (NSW 61667).

A Typo in caudice aliquando arborescente usque ad 1 m. alto, in foliis ca. 4–8 mm. vel usque ad 12 mm. latis, nitentibus, planis, differt. Caudex simplex vel nonnulli-ramosus, forsitan altior in locis altioribus, spicae 20–100 cm. longae, 11–35 mm. diametro, quam scapos multo (saepe 2 × –3 ×) breviores, scapi 7–20 mm. diametro.

Differs from the Type in its tendency to arborescence, and its broader, nearly flat leaves, and from *X. arborea* in its bright green, shining leaves and its often more slender spike which is much shorter than its scape. Caudex subterranean to about 1 m. high (sometimes higher but perhaps only in hybrid derivatives), with one or several shoots, the taller trunks often developed in places of higher altitude; scapes 0.3–2.5 m. long, usually 1.5–2 m., and 7–11 mm. in diameter, much longer than the spike of about 20–100 cm. in length and 11–30 mm. in diameter. Populations of presumed hybrid derivation from this subspecies and *X. australis* ssp. *australis* are described and cited under that taxon. Hybridism between *X. media* ssp. *latifolia* and *X. johnsonii* along the Queensland coast is probably not uncommon and though the two tend to form separate communities with some differences in habitat, they may interbreed where these are contiguous. Such plants are often arborescent to about 1 or 2 m., with spikes near the size of *X. johnsonii* and a narrower, more quadrangular leaf than in *X. media* ssp. *latifolia*.

Distribution (Map 3): Central Coast of New South Wales from about Gosford to coastal Queensland about as far north as Townsville, in coastal flats or in the eastern slopes and highest parts of the coastal ranges; also forming large populations of presumed hybrid derivatives from *X. australis* ssp. *australis* (q.v.) in the coastal ranges from near Wyong, N.S.W., to at least as far north as southern Queensland, and others from *X. johnsonii* in the far North Coast of New South Wales and in Queensland, marked * below.

Queensland: Cooktown, Blake No. 15078, 7.1943 (BRI 029187)*; Murray Upper via Tully, Fisher 12.1954 (BRI 029168-9)*; Mt. Spec, Kennedy 6.1963 (NSW 67466); near top of Mt. Spec, Kennedy 6.1964 (NSW 72221); Moongabulla, Paluma Ra., Kennedy 6.1963 (NSW 68262)*; Hayman Is., White No. 10193, 6.1934 (BRI 029165)*; Sarina, Francis 4.1927 (BRI 029143); Byfield, White No. 8161, 9.1931 (BRI 029160)*; Lakes Creek, Rockhampton, Boorman 8.1912 (NSW 59825); Gladstone, White 7.1920 (BRI 029157); Boyne Valley Junction (BRI 029134-5, 029162); Baffle Creek, White 4.1920 (BRI 029144-5); Mt. Perry, Keys (BRI 029132); Goodwood (BRI 029161); Takura–Pialba line (BRI 029156); Howard dist., Poison Pl. Comm. 2.1938 (BRI 029159); Tin Can Bay, Smith No. 4454, 4.1950 (BRI 029158)*; Noosa Heads, Aston No. 106, 10.1958 (MEL)*; Mt. Coolum, Smith No. 4453, 4.1950 (BRI 029138-9)*; Landsborough, White 9.1919 (BRI 029147); North of Beerwah, Smith No. 4452, 4.1950 (BRI 029136) and No. 4451, 4.1950 (BRI 029140); Beerwah, Constable 5.1962 (NSW 61667); Mt. Ngungun, Glass House Mts., Johnson 5.1961 (NSW 56680); Elimbah, Clemens 7.1943 (BRI 029137); 3 miles towards Ashgrove from Jolly's Lookout, Phillips 8.1963 (NSW 64326)*; North Pine, Bick 4.1915 (BRI 029150-1); Wellington Point, White 9.1919 (BRI 029152); Goodna, White 9.1915 (BRI 029146) and 6.1916 (BRI 029148); 10 miles N of Wyberba on Ukey road, Constable 3.1962 (NSW 57574)*.

4. **Xanthorrhoea arborea** *R. Br.*, Prodr. (1810) 288.

HOLOTYPE: Port Jackson, R. Brown 17.5.1802; lost from BM.

NEOTYPE, here designated: *New South Wales:* Manly, E. Cheel 1.1900 (NSW 56675).

This species is characterised by its arborescent habit, long, stout spike nearly equal in length to the scape (about 1–2 m.), broad (5–8 mm.) flattish leaves often dull or slightly bluish-green in aspect and acute fruits (Fig. 3, a). It occurs on the Triassic Sandstones from Port Hacking to country east of Rylstone, N.S.W., and its usual habitat near Sydney is on the south-facing, cooler slopes or lower or more sheltered parts of the north-facing rocky hills. These plants were abundant in the small valleys around the first settlement at Sydney Cove and figure in many of the early illustrations of the Colony. Usually above them on the more exposed ridges of the Hawkesbury Sandstone are to be found plants of the closely related *X. media* ssp. *media* but there is little evidence of intergradation between them. Further north these two species, in which characters of leaf breadth, arborescence and spike size are correlated, seem to give place to a population in which their characters, perhaps with those of *X. minor* also, are merged, namely *X. media* ssp. *latifolia.*

DISTRIBUTION (Map 5): Central Coast and Central Tablelands of New South Wales.

Under *X. arborea*, Bailey (Qld. Fl. V (1902) 1665) is describing not this species but some of the hybrids derived from *X. australis* ssp. *australis* and *X. media* ssp. *latifolia*, though his note that it is "the common large form in southern localities" suggests that he was including the widespread *X. media* ssp. *latifolia*, which is sometimes arborescent, under the same name.

5. **Xanthorrhoea johnsonii** *Lee*, **sp. nov.**

HOLOTYPE: *Queensland:* Between Dimbulah and Petford, Johnson 5.1962 (NSW 61293).

Species arborescens caudice alto usque ad 2 m.; folia viridia quadrangulata, 1–2, saepe 1.5, mm. lata, in sectione fere quadrato-rhombica; scapus 50–120 cm. longus, gracilis et 4–11 mm. diametro quam spicam ca. 15–30 mm. diametro 4–80 cm. per longitudinem saepe longior, vel crassior et 15–25 mm. diametro quam spicam ca. 30–60 cm. diametro 45–225, plerumque ca. 100, cm. per longitudinem saepe brevior; bracteae ciliatae vel subglabrae brevi-acutae ad sublongi-acutae, fascicularis obscurae vel subprominentes spicae basi, pubescentes abaxiale.

An arborescent species with an often undivided caudex up to 2 m. high, with distinctly quadrangular narrow leaves almost square in section and 1–2, often 1.5, mm. broad, apparently green (or sometimes greyish green but perhaps only in hybrid derivatives from *X. australis*); the crown of leaves tends to be divided into a more or less erect part of young leaves and a narrow "skirt" of old leaves reflexed over the trunk; scape 50–120 cm. long, slender (4–11 mm. in diameter) and often longer than the spike of 15–30 mm. diameter and 4–80 cm. length, or stouter (15–25 mm. or more in diameter) and often equal to or shorter than the spike of about 30–40 or up to 60 mm. diameter and about 100 (45–225) cm. length; scape smooth or finely wrinkled (or rarely coarsely wrinkled as in *X. australis* and perhaps only in hybrid derivatives), the spike green at flowering and becoming straw-coloured, light brown or pinkish from the bract colour soon afterwards, the tips finally darkening; bracts ciliate to almost glabrous, short-acute to intermediate in form, the cluster bracts obscure or often somewhat prominent only in the lower part of the spike, pubescent to tomentose on the abaxial surface.

This species is closely related to *X. australis* which it resembles in its capacity for arborescence, its quadrangular leaves, and its occasional development of prominent cluster bracts and of somewhat long-acute bracts, and it is very probable that hybridism between the two would occur, especially since they are both found on soils of igneous or metamorphic origin. Some of the less constant characters given for *X. johnsonii* above may indeed be the result of such hybridism, but at present a single specimen from southern Queensland and a few from the North West Slopes of New South Wales are the only evidence. In these some coarse wrinkling of the scape and longer bract-tips are features of *X. australis*, though the prominent cluster bracts of that species are lacking and little is known of these plants in the field. The Queensland specimen is a slender spiked form from an area where the stouter forms of *X. johnsonii* occur, and this suggests an origin from the ssp. *acaulis* of *X. australis*, though this subspecies is not known from Queensland. Indeed *X. australis* is known only from the south in Queensland (cf. NSW 56700 and BRI 029170–1 cited under *X. australis* ssp. *australis*) so that it is here that evidence of hybridism would be expected to appear, but it is also possible that there may be occurrences further north (see *X. australis* ssp. *australis*).

A few communities of presumed (from an observed hybrid swarm, *fide* L. A. S. Johnson) hybrid derivatives from *X. johnsonii* and *X. resinosa* ssp. *fulva* have the arborescent habit and stout inflorescence of southern *X. johnsonii* but the bracts are more or less tomentose at the apex; other apparent hybrid derivatives have been observed in coastal Queensland between *X. johnsonii* and *X. media* ssp. *latifolia* (q.v.) and may be quite common from the North Coast of New South Wales to the northern Queensland coast.

Distribution (Map 1): Coast, ranges and their slopes over most of eastern Queensland, at least as far north as Cairns, and in the North Coast, Northern Tablelands and North Western Slopes of New South Wales, usually on hillsides in the coastal localities, with some specimens suggesting hybridism with *X. australis* ?ssp. *acaulis* in the North West Slopes of New South Wales and in southern Queensland (marked * below), and others of presumed hybrid derivation from *X. resinosa* ssp. *fulva* in the North Coast of New South Wales and on Stradbroke Island, Queensland (marked † below).

Queensland: W of Mareeba, Mesmer 9.1962 (NSW 66041); 5 miles NW of Dimbula, McKee No. 9239, 4.1962 (NSW 57555; between Dimbulah and Petford, Johnson 5.1962 (NSW 61293); Walsh's Pyramid (BRI 029188); 2 miles S of Stannary Hills, McKee No. 9433, 4.1962 (NSW 57558); Ravenshoe, Mesmer 8.1962 (NSW 59789); Wyoming, Mesmer 9.1962 (NSW 66042); 20 miles W of Greenvale Station, Speck No. 4661, 7.1954 (CANB); Townsville-Ingham-Blue R. crossing, Hall 6.1956 (BRI 000935); foot of Mt. Spec road, Paluma Ra., Kennedy 6.1964 (NSW 72220); Deep Creek 16 miles N of Townsville, Kennedy 6.1963 (NSW 64346); 31 miles SW of Ayr, N of Mt. Benjonney, Smith No. 4379, 6.1949 (BRI 029184); 14 miles NW of Emerald, Adams No. 1287, 9.1964 (NSW 72222); Springsure, Bick No. 7, 5.1915 (BRI 029177); Springsure, ? Wuth No. 177 (MEL); Mt. Perry, Keys No. 569 (BRI 029189); Mt. Ivory, Pedley No. 328, 10.1958 (BRI 012940) and No. 328A, 10.1958 (BRI 012939)*; Pelican, Ryan 10.1958 (BRI 012943); Highland Plains NNE of Oakey, Grove 10.1958 (BRI 012937-8); Gympie road near Brisbane, Bick No. 6, 4.1915 (BRI 029190-2); near Brisbane in Sunnybank cemetery reserve, Blake No. 14284, 8.1940 (BRI 029182-3); Stradbroke Is., McKee No. 8716, 9.1961 (NSW 56688); Stradbroke Is., McKee No. 8717, 9.1961 (NSW 56687); Stradbroke Is., McKee No. 8744, 9.1961 (NSW 56784)†; Wyaga, White 9.1919 (BRI 029176).

The record of *X. bracteata* from Queensland by Bentham (Fl. Austral. VII (1878) 116) is based on some unsatisfactory specimens at MEL; those from Newcastle Ra., F. Mueller, and Springsure, ? Wuth are probably *X. johnsonii;* Bailey (Qld.

Fl. V (1902) 1665) quotes Bentham, but his description appears to be mixed; he also (ibid. p. 1664) cites a specimen (not seen) from "hills about Cairns" under *X. minor* which might be *X. media* or one of the smaller forms of *X. johnsonii* which occur in that situation; Bailey's use of *X. quadrangulata* (ibid. p. 1666) also seems to apply to *X. johnsonii*, and Domin (Bibl. Bot. XX Heft 85[1] (1915) 527) described Queensland plants under *X. quadrangulata* which probably belong to *X. johnsonii*, though I have not seen the cited specimen. *X. quadrangulata* and *X. johnsonii* are undoubtedly very close morphologically but the following differences have been noted: *X. quandrangulata:* Flowers (? always) yellow; spike dark brown, rather stout, shorter than the scape; capsule with points 2–5 mm. long; leaves in a more or less spherical crown. *X. johnsonii:* Flowers white; spike light coloured, stout and exceeding the scape to slender and shorter than the scape; leaves, when old, hanging close around the caudex, thus forming a narrow " skirt "; capsule points 1–2 mm. long.

6. **X. australis** *R. Br.*, Prodr. (1810) 288.

HOLOTYPE: *Tasmania:* Grass Tree Hill near Risdon Cove, R. Brown, Iter Austral. No. 5775, 2. 1804 (BM).

TOPOTYPE: *Tasmania:* Grass Tree Hill, D. Martin 13.12.1962 (NSW 63238).

The Holotype specimen of *X. australis* consists of leaf pieces only as does its duplicate at Kew, and since the spike characters are diagnostically important and since urban development is rapidly reducing the numbers of these plants in the Type locality, the Topotype specimen above is set up to guide interpretation of the original description and to establish this writer's concept of the species. Dr Martin, who examined the Grass Tree Hill community, expressed the opinion that specimens of *Xanthorrhoea* there were all conspecific.

Typically *X. australis* comprises an arborescent population with distinctly quadrangular leaves, a stout spike exceeding a relatively short scape, and light coloured, long-acute bracts and prominent cluster bracts (Fig. 6, a, b, c) throughout the spike, but these characters do not all obtain in an acauline, short-spiked subspecies, nor in many of the specimens believed to be derived from *X. australis* by hybridism (see ssp. *australis*).

DISTRIBUTION (Map 2): Queensland (as hybrid derivatives only), New South Wales and Victoria, chiefly in the Great Dividing Range and its inland slopes just into South Australia, and in the north and east of Tasmania.

The description under *X. australis* in J. D. Hooker (Fl. Tas. II (1858) 58) seems to apply to some of the smaller Tasmanian plants rather than the tall arborescent form in the original description, and may describe intergradant specimens believed to be hybrid derivatives from *X. australis* and *X. minor*. The description under *X. australis* in Black (Fl. S. Austral. ed. 2 (1943) 195) is derived from mixed material including both *X. australis* and *X. minor*, though the two species have recently been distinguished on the eastern side on the Murray River in South Australia (J. B. Cleland, p.c. 7.1965). Hooker, however, describes (ibid. p. 59) *X. australis* ssp. *australis* under the name *X. hastilis*.

The Type specimen from Tasmania is well matched in Victoria and New South Wales, but the species shows considerable inherent variation as well as much putative hybridism. In New South Wales collections are numerous enough to support division of the species into two subspecies described below; these may prove to be distinguishable in Victoria also, but material from that State is as yet very inadequate.

a. **Xanthorrhoea australis** ssp. **australis.**

Often massive, arborescent plants with caudex commonly branched and sometimes several times, especially in the northern part of the range, often 1–3 m. high, but sometimes more especially in higher altitudes. Leaves narrow, quadrangular, 1–2 mm. broad, thin to thick (*very depressed-obtrullate* or *rhombic* to *quadrate-rhombic* in section) with a greyish or silvery aspect sometimes scarcely noticeable, forming a roughly spherical crown of leaves rather than a narrow skirt of old hanging leaves distinct from more or less erect young ones. Spike stout and sometimes very large, often 3–6 cm. in diameter, 50–350, usually 90–200 cm. long, light or gingery brown at anthesis, longer than its scape. Scape stout, coarsely wrinkled, 1.1–4, usually 1.5–3, cm. in diameter, 35–150 cm. long. Bracts light brown, often yellowish inside, the tips darkening with age, long-acute, with very long-pointed cluster bracts upturned as much as 2 cm. over the bract surface or sometimes scarcely prominent among very long-acute bracts.

Specimens of hybrid derivation from this subspecies and *X. media* ssp. *latifolia:* caudex sometimes up to 7 m. high, several-branched. Leaves broader, to 4 mm. broad, and relatively thinner, usually without any greyish aspect and often with a very thick, dark purplish-red base. Spikes as in the subspecies in size but the scape often of nearly equal length, each about 1 m. long, the scape usually almost smooth, and the bracts darker in colour so that the spike has a dark brown aspect. Bracts often intermediate or even short-acute in form, cluster bracts less prominent or even obscure.

Two recently collected specimens are apparently of hybrid derivation from this subspecies and *X. resinosa*, probably ssp. *resinosa:* caudex about 1 m. high, flattish or quadrangular leaves 3.5 mm. broad, the long stout spike of *X. australis* ssp. *australis* shorter or longer than its scape, but with short-acute, tomentose bracts like those of *X. resinosa.*

Other populations of presumed hybrid derivation from this subspecies and *X. media* ssp. *media*, or *X. minor*, are described under those taxa, and possible hybridism with *X. johnsonii* is mentioned under that species.

Distribution (Map 2): Chiefly in the Tablelands throughout New South Wales usually on soils of igneous or limestone origin, reaching the North Coast apparently by way of river valleys in a few places; in Victoria chiefly in the Great Dividing Range from the New South Wales border just into South Australia, and in the north and east of Tasmania, with hybrid derivatives from *X. media* ssp. *latifolia*, marked * in the citations below, in mountains of southern Queensland on soils of igneous derivation, and in ranges of coastal New South Wales from near Wyong to the Queensland border often on similar soils and in association with or even in rainforest; with other hybrid derivatives from *X. resinosa* ?ssp. *resinosa* in the South Coast of New South Wales, and others from *X. media* ssp. *media* (q.v.) in the Central Coast of New South Wales and from *X. minor* (q.v.) in Tasmania, and possibly from *X. johnsonii* (q.v.) in the North Western Slopes and Northern Tablelands of New South Wales.

Queensland: Bunya Mts., Cleland (NSW 56700)*; Mt. Cordeaux, White No. 13142, 11.1949 (BRI 029170-1)*.

Victoria: Upper Murray R., Findlay 1883 (MEL); Hume's R. (i.e. Murray R.), *scripsit* F. Mueller (MEL); Grampians, Walter 11.1900 (NSW 56698); Hall's Gap, Grampian Mts., Joshua 1963 (NSW 67462); Torquay, Williamson (MEL); Wilson's Promontory, *scripsit* F. Mueller (MEL).

TASMANIA: Sister's Creek, Martin 12.1963 (NSW 67463-4); S of The Gardens, NE Tasmania, Wolfe Nos. 1-2, 10.1962 (NSW 66053); 8 miles S of St. Helens, per Martin (NSW 67357); N of Coles Bay, Wolfe No. 4, 10.1962 (NSW 66051) and No. 5, 10.1962 (NSW 66052); Grass Tree Hill near Risdon Cove, Brown 2.1804 (BM, Iter Austral. No. 5775, photograph only seen); Grass Tree Hill, ½ mile N of highest point on Risdon-Richmond road, Martin 12.1962 (NSW 63238); Grass Tree Hill, E dolerite spur, Martin 1.1963 (NSW 66545); Grass Tree Hill, Jackson 10.1961 (HO 3863); North Bruni Is., Rodway 1.190! (NSW 61349); North Bruni Is. Martin 6.1964 (NSW 64590); Tasmania, Carpenter 1919 (NSW 56699).

This subspecies is described by J. D. Hooker (Fl. Tas. II (1860) 59) quoting a manuscript of Gunn) under the name *X. hastile.* Bailey (Qld. Fl. V (1902) 1665) described hybrid derivatives from this subspecies and *X. media* ssp. *latifolia* under the name *X. arborea;* these plants represent the only form in which *X. australis* is known in Queensland.

A recent collection comprising leaves, photograph and young spike from Magnetic Island, Queensland, is of considerable interest: Arcadia, Magnetic Island, Kennedy No. 4, 7.1963 (NSW 67465). Queensland botanists do not know of any occurrence of *X. australis* ssp. *australis* north of one near the Bunya Mountains, yet this specimen from Magnetic Island has potentially all the characters of the subspecies though it is too young to be sure of the ultimate bract and cluster bract form. Its caudex is about 1 m. tall, leaves are narrow-quadrangular, 2 mm. broad and the spike has distinctly prominent cluster bracts right to the tip, while the incompletely grown floral bracts suggest an intermediate or even long-acute form. All these characters could be ascribed to *X. johnsonii* except for the cluster bracts which are definitely those of *X. australis,* while another specimen of imperfect and old spike from Ingham: near Ingham, Narrea (BRI 029178), shows long-acute bracts seen only in the latter species and its hybrid derivatives. These two specimens, unsatisfactory as they are, suggest that *X. australis* ssp. *australis* may yet be found further north than at present known or, perhaps more likely, that its genes have persisted in hybrid populations and are now being manifest far from the site of its occurrence. On the other hand, the character of the cluster bracts of the Magnetic Island plant may prove to be temporary, though the Ingham plant, unless misleading because of its age, still suggests an element of *X. australis* ssp. *australis* in the area.

b. **Xanthorrhoea australis** ssp. **acaulis** *Lee,* **ssp. nov.**

HOLOTYPE: *New South Wales:* 6½ miles W of Dubbo, Constable 9.12.1961 (NSW 61344).

A Typo habitu acaule vel subacaule, spica multo minore, et scapo gracilliore spicam excedente, differt. Spica 12–30 cm. longa, 1.7–3.0 cm. diametro; scapus saepe ca. 30 cm. longus, quam spicam longior, 7–12 mm. diametro.

Differs from the Type in its permanently acauline or near-acauline habit, and in its much smaller inflorescence, the spike 12–30 cm. long, 2.2–3.5 mm. in diameter, thus often shorter than the slender scape of about 30 cm. length and 1 cm. diameter. Intermediate forms between this and ssp. *australis* are apparently fairly common, but there seems to be a considerable correlation of small spikes with caespitose habit, and of stout spikes longer than the scape with arborescent habit.

Possible hybridism of this subspecies with *X. johnsonii* is mentioned under that species.

DISTRIBUTION (Map 2): Western Slopes and western parts of the Northern and Central Tablelands of New South Wales, perhaps with hybrid derivatives from *X. johnsonii* (q.v.) in the North West Slopes of New South Wales and in southern Queensland.

7. **Xanthorrhoea macronema** Benth., Fl. Austral. VII (1878) 113.

LECTOTYPE, here selected: *New South Wales:* Hastings R., Dr Beckler (K; ISOTYPE MEL).

PARATYPES: Moreton Is., McGillivray, 10.1847 (K); Tweed R., Chas. Moore, recd. 9.1874 (K).

Although Mueller's publication of this name (Fragm. IV (1864) 112) was of a Provisional Name only, Bentham is considered to have attributed the authorship intentionally to Mueller. Bentham cited three syntypes which are extant at Kew (not seen by me but examined by L. A. S. Johnson, Australian Liaison Officer, 3.1963) and of these the Lectotype above is designated to stabilise the nomenclature.

An acauline species characterised by its short spikes on long, very slender scapes, large flowers with perianth and long stamens spreading at anthesis not recurved as in other species, short-acute bracts and obscure cluster bracts, triangular leaves (in section) with several deep grooves between the ribs, and very scabrid margins.

DISTRIBUTION (Map 5): Central and North Coast of New South Wales and south eastern Queensland.

QUEENSLAND: Fraser Is., White No. 2530, 5.1925 (BRI 029114); Fraser Is., White 10.1921 (BRI 029109); Noosa Heads, White 1.1920 (BRI 029122); Coolum, Trapnell 11.1960 (BRI 025965); sandstone ridges going to Burun, Leichhardt 12.1843 (MEL); Buderim Mt., White 4.1912 (BRI 029112); Eudlo Creek, Bailey 11.1898 (BRI 029117); Mooloolah Swamp, Bailey 12.1890 (BRI 029118); Tallebudgera, White 3.1923 (BRI 029130); Landsborough, White No. 9636, 11.1933 (BRI 029124); Candle Mt., White 5.1918 (BRI 029120); Moreton Bay, Stuart (MEL); Mt. Gravatt, Bick 4.1915 (BRI 029121, 029129); Stradbroke Is., Scortechini & Bailey, Oct. (BRI 029116); Stradbroke Is., Bick 4.1915 (BRI 029119); Russell Is., White 9.1913 (BRI 029128); Tambourine Mt., Longman & White 2.1917 (BRI 029110, 029113); Coolangatta, Simmonds (BRI 029127); Macpherson Ra., White 12.1915 (BRI 029111).

ADDENDUM. Since this paper went to press, J. B. Cleland, in S. Austral. Nat. XL (1965) 27, has published his corrected interpretation of the species of *Xanthorrhoea* in South Australia, revealing that both *X. australis* and *X. minor* occur in the extreme south-east, on the Victorian side of the Murray River (see above, pp. 46 and 51). His description of a colony as consisting of a few plants of *X. australis* together with hundreds of *X. minor* may be a correct interpretation, but it is possible that the colony comprises a hybrid swarm containing the two species and intergradants, some of the last being perhaps young (trunkless) *X. australis*.

Notes on *Acacia deanei*

MARY D. TINDALE

SUMMARY

Two geographic subspecies are recognized in *Acacia deanei*, since *A. paucijuga* F. Muell. ex N.A. Wakef. is reduced to a subspecies of the former. A key to these taxa is provided, also a list of representative specimens and notes on their distribution. Chromosome counts on both subspecies have been supplied by Barbara G. Briggs (personal communication).

Acacia deanei (R.T. Bak.) Welch, Coombs et McGlynn occurs in drier country than do most species of the *A. decurrens* group. It is a bushy shrub or small tree up to 7 m. high, often occurring on red soil plains or stony hillsides. However it is found on a variety of soils including sandy loams, gravelly clays and clay loams. Two geographic subspecies can be recognised.

Acacia deanei (*R.T. Bak.*) *Welch, Coombs et McGlynn* in Journ. Roy. Soc. N.S.W. LXV (1931), 1932, 227.

ABSOLUTE SYNONYM: *Acacia decurrens* (Wendl.) Willd. var. *deanei* R.T. Bak. in Proc. Linn. Soc. N.S.W. XXI (1896) 348.

KEY TO THE SUBSPECIES

1. Pinnules mostly 1 to 4.5 mm. long. Corolla usually clothed with golden hairs towards the apices of the lobes. Ribs of the calyx glabrous to tomentose. Upper pinnules mostly obtuse .... ssp. *deanei* a.

1.* Pinnules mostly 5 to 11 mm. long. Corolla glabrous. Ribs of the calyx usually glabrous. Upper pinnules mostly truncate .... ssp. *paucijuga* b.

However a number of intermediates do occur especially on the Central Western Slopes of New South Wales where both subspecies are common wayside trees and shrubs. In some specimens of ssp. *deanei* the corollas are almost glabrous.

A. deanei ssp. *deanei* has a more northern distribution than ssp. *paucijuga*, being found in the drier parts of south-eastern Queensland, as well as on the Western Slopes, Western Plains and a few localities in the Northern Tablelands of New South Wales, whereas ssp. *paucijuga* occurs on the Central and South Western Slopes, the Central and Southern Tablelands of the latter State, as well as on the Western Plains. This subspecies extends into Victoria at Suggan Buggan, Deddick and the Snowy River Valley.

a. ssp. **deanei.**

HOLOTYPE: Gilgandra, New South Wales, Henry Deane. No type material could be traced but R.T. Baker provided a critical description, so that there is no doubt concerning the identity of *A. deanei.*

REPRESENTATIVE SPECIMENS: *Queensland:* a few miles E of Kogan, in sandy wash at foot of ridge, L. S. Smith No. 10254, 10.1957 (BRI; NSW 60015); 2 miles S of Wyberba, erect shrub to small tree 15 ft. high, in gravelly clay, Constable No. 2038, 3.1962 (NSW 63189). *New South Wales:* Mt. Exmouth Slopes, 1800 ft. alt., erect bushy tree 12 to 15 ft. high, Johnson & Constable 4.1952 (NSW 20352); Lightning Ridge–Goodooga, 400 ft. alt., Constable 5.1951 (NSW 18446); 5 miles W of West Wyalong, tree 7 ft. high, often a shrub, on the red soil plains with *Acacia cardiophylla* and *Cassia nemophila*, Tindale 10.1963 (NSW 63795).

b. ssp. **paucijuga** (*F. Muell. ex N.A. Wakef.*) *Tindale* **comb. et stat. nov.**

Basionym: *Acacia paucijuga* F. Muell. ex N. A. Wakefield in Vict. Nat. LXXII (1955) 93.

lectotype: In virgultis planitierum steriliorum ad flumen Broken Bay, gregaria. Fruct. 7–10 ft. alt. Dr. M. (= von Mueller), (MEL), examined.

Representative Specimens: *New South Wales:* 6 miles S of Grenfell on the road to Young, small tree with smooth, green, ridged bark, on red soil plains, Tindale 10.1963 (NSW 63790); 9 miles S of Temora, along roadside, Boyd 12.1962 (NSW 68290); near Grong Grong, tree 12 ft. high, on red soil plains, Tindale 10.1963 (NSW 63858); Walbundrie, 700 ft. alt., tree 20 ft. high, on clay loam, McBarron & Tindale 10.1952 (NSW 39540). *Victoria:* Suggan Buggan River Valley, 1500 ft. alt., on dry stony hillslopes, Wakefield No. 2093, 1.1947 (NSW 78664).

Chromosome Counts

A chromosome count of $2n = 26$ was made for *A. deanei* ssp. *deanei* by Barbara G. Briggs (personal communication) on material which she collected in *Eucalyptus–Callitris–Acacia* woodland, 4 miles north of Gilgandra, N.S.W., in August 1964 (NSW 78663). Dr. Briggs has also recorded previously unpublished counts on two of my collections of ssp. *paucijuga*. They are as follows: $2n = 26$ on material obtained 1 mile SW of Rankin Springs, N.S.W., on the 29th October 1963 (NSW 63857) and $3n = 39$ for a specimen collected at Derain, N.S.W., on the 30th October 1963 (NSW 63788). It is not known whether such triploid individuals are frequent in this subspecies but previously published counts for members of the *A. decurrens* group have been diploid.

ACKNOWLEDGEMENTS

I wish to thank the Director of the National Herbarium of Victoria, Melbourne, and the Government Botanist, Botanic Museum and Herbarium, Brisbane, for the loan of specimens of this species. My thanks are due to Dr. Barbara G. Briggs who kindly undertook the cytological work and made field collections. Mr. A. B. Court and Mr. E. F. Constable also assisted in various ways.

The Status and Relationships of the Australasian Species of *Typha*

BARBARA G. BRIGGS AND L. A. S. JOHNSON

SUMMARY

Previous treatments of *Typha* in Australasia and Malesia have generally either (a) referred all material to *T. angustifolia* L., or (b) recognised two taxa, one being variously referred to *T. angustifolia*, *T. angustifolia* var. *brownii* (Kunth.) Kronf. or *T. brownii* Kunth., and the other to *T. muelleri* Rohrb. The present study indicates that *T. angustifolia* is a north temperate species and that there are two species native in Australia and Malesia, namely *T. domingensis* Pers., which is widespread in tropical and warm temperate zones throughout the world, and *T. orientalis* Presl. The latter was originally described from the Philippines but should include Australian, New Zealand and Malesian material previously known as *T. muelleri*. Chromosome numbers are $2n=30$ in *T. domingensis* and $2n=60$ in *T. orientalis*. Typification of names, distinguishing characters, distributions and relationships of species are discussed. Features of the floral morphology of the genus are described, with comment on morphological interpretations; the Typhaceae appear to show affinity with the Sparganiaceae but not with the Pandanaceae.

PREVIOUS TREATMENTS

Taxonomic treatments of *Typha* in Australia have long varied in the number of taxa recognised. The monograph of the genus by Graebner (1900) is inadequate and the system of nomenclature which he employed is largely contrary to the requirements of the International Code of Botanical Nomenclature. He recognised two entities in Australia, including some collections under *T. angustifolia* L. var. (or "proles") *brownii* Kronf. Other material from the Australian mainland, Tasmania and New Zealand was included in *T. muelleri* Rohrb., which he placed as a subspecies of *T. angustifolia*, although invalidly using the binomial in that rank. Later he described *T. basedowii* from South Australia (Graebner 1915).

The only critical treatment of Australian *Typha* has been that of Melvaine (1940) who recognised two taxa, *T. angustifolia* var. *brownii* (including *T. basedowii*) and *T. muelleri*. Thompson (1961) and Beadle, Evans and Carolin (1963) followed Melvaine's treatment, recognising *T. angustifolia* and *T. muelleri*.

Black (1943) and Willis (1962) recognised only one species, using the name *T. angustifolia* and dismissing as trivial the distinctions given by Melvaine. However, Eichler (1965) considered that South Australian material probably differed specifically from European *T. angustifolia*.

In New Zealand, Cheeseman (1906, 1925) accepted only *T. angustifolia*, although he referred to Graebner's treatment and stated, incorrectly, that Graebner had published the combination *T. angustifolia* var. *muelleri*. This varietal combination was accepted, and attributed to Cheeseman, by Domin (1915). However, Cheeseman had neither proposed nor accepted it; therefore it should in fact be cited as *T. angustifolia* var. *muelleri* (Rohrb.) Domin. Later, Roscoe (1927) reported cytological observations on New Zealand material identified as *T. angustifolia* var. *muelleri*.

For reasons indicated below, we consider that the name *T. domingensis* Pers. should be adopted for the Australian material which Melvaine and Thompson, respectively, referred to *T. angustifolia* var. *brownii* and to *T. angustifolia*. Also, the name *T. orientalis* Presl should be used for the plants previously known as *T. muelleri*.

Examples of these two species are the specimens cited by Thompson (1961), under the names indicated, but these represented only part of the local material in the National Herbarium of New South Wales at that date, and the collection has been augmented considerably in the course of the present study.

Citation of bibliographic references for names mentioned may be found in Graebner (1900), Melvaine (1940) and Hotchkiss and Dozier (1949).

CITATION AND TYPIFICATION OF NAMES

T. domingensis Pers., Syn. Pl. II (1807) 532. Type from S. Domingo, not examined.

T. brownii Kunth, Enum. Pl. III (1841) 92. This name is based on material which R. Brown, Prodr. Fl. Nov. Holl. (1810) 338, cited under *T. angustifolia*. Brown's account mentions collections from near Port Jackson and from Tasmania, the localities being represented by his usual symbols. Enquiries at the British Museum (Natural History), Kew, Edinburgh and Melbourne have not located any specimen agreeing with either cited locality. Two of Brown's collections are known, and we have examined floral material of both: a specimen of *T. domingensis* labelled "North Coast, Iter Australiense" in Kew, and a specimen in Edinburgh of *T. orientalis* with no indication of its locality within Australia. Neither species can be excluded by the very brief description or by absence from the regions cited, but neither specimen can be regarded as entirely fitting the particulars mentioned. In the absence of a holotype it appears desirable to designate a NEOTYPE, namely the following specimen chosen from one of the regions cited by Brown and maintaining the usage of the epithet by recent authors:

Box Hill, 7 miles SE of Windsor (corner of Windsor and Nelson roads), N.S.W., E. F. Constable No. 5624b, 11.1.1965 (NSW 77114).

Thus typified, the name *T. brownii* is to be regarded as a taxonomic synonym of *T. domingensis*.

T. basedowii Graebn. in Feddes Rep. Spec. Nov. XIII (1915) 497. Type from South Australia, not examined. See comments by Melvaine (1940).

T. orientalis Presl, Epimel. Bot., Königl.-Böhm. Ges. Wiss., Ser. 5, VI (1852) 599. Island of Cebu, Philippines, Cuming No. 1767 (K, examined), ISOTYPE or possibly HOLOTYPE; there is no duplicate in Presl's herbarium at PRC.

T. muelleri Rohrb. in Verh. Bot. Ver. Brandenburg XI (1869) 95. In paludosis ad radices montis Elizamountain, Perth, L. Preiss No. 1874, 19.1.1839, LECTOTYPE. (ISOLECTOTYPE in MEL examined.) Originally labelled *T. shuttleworthii* Sond. et Koch.

T. latifolia L., Sp. Pl. II (1753) 971. Type European, not examined.

DISTINGUISHING FEATURES

Two taxa, *T. domingensis* and *T. orientalis*, are native in Australia and *T. latifolia* is naturalised in a few localities. As pointed out by Melvaine, *T. basedowii* does not appear to be distinct from *T. domingensis*.

T. domingensis and *T. orientalis* differ in the shape and abundance of bracts in the female spike but in a very small proportion of specimens of the former there are few bracts; the shape of the stigma (Fig. 1) is therefore considered a more reliable discriminatory character. Melvaine described these minute bracts but referred to them as bracteoles.

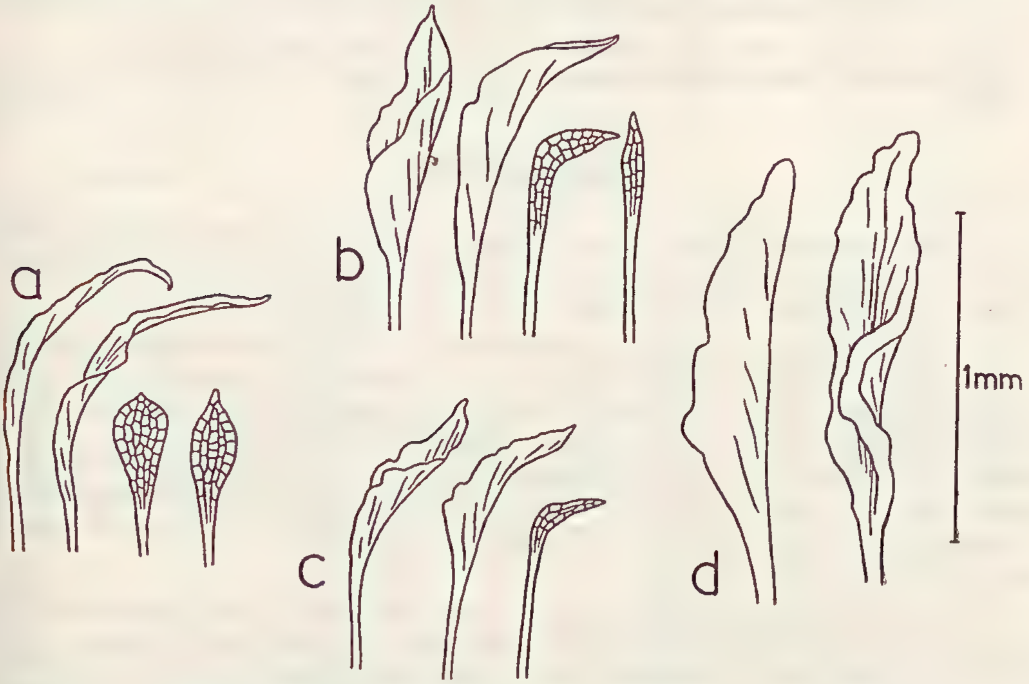

Fig. 1. Stigmas (left) and floral bracts from female spike. (a) *T. domingensis*, Box Hill, N.S.W., neotype of *T. brownii* (NSW 77114). (b) *T. orientalis*, Wiangarie near Kyogle, N.S.W. (NSW 84789). (c) *T. orientalis*, isotype or holotype, Island of Cebu, Philippines (K). (d) *T. latifolia*, Faulconbridge, N.S.W. (NSW 77108); this species lacks floral bracts.

In chromosome number *T. orientalis* ($2n=60$) differs from *T. domingensis* and *T. latifolia*, both the latter having $2n=30$. Plants of *T. orientalis* are commonly larger than those of *T. domingensis* and the leaves have a more bluish-green hue. There is also a tendency, as noted by Domin (1915), for the leaf lamina in dried specimens to be biconvex in the region immediately above the auricles in *T. orientalis* (although concave when fresh), in contrast to the concavo-convex or plano-convex condition in *T. domingensis* and *T. angustifolia* s. str. Care must be used in identifying specimens which have over-mature inflorescences, since part or all of the stigmas and the laminae of the bracts may fall away while the other floral structures remain in position.

KEY TO THE SPECIES IN AUSTRALIA, NEW ZEALAND AND NEW GUINEA

1. Bracts usually present in the female inflorescence; stigmas linear to narrow-obovate, acuminate, markedly concave transversely, not fleshy; female spikes cinnamon- or chestnut-brown; pollen shed as single grains.

    2. Bracts in the female inflorescence numerous, broadly spathulate (usually 4–8 cells across the lamina). Stigmas linear. Mature female spikes 0·5–2 cm. diam., length 6–20 (–30) times diam., cinnamon-brown (due to the numerous pale ends of the bracts interspersed among the darker stigmas and the carpodia). Male and female spikes separated by (0·5–) 2–5 cm. Sheaths of the upper leaves not auriculate or only the uppermost 1–2 leaves distinctly auriculate .... *T. domingensis*

2.* Bracts in the female inflorescence few, or sometimes apparently absent, narrowly spathulate (usually 3–4 cells across the lamina). Stigmas narrow-obovate. Mature female spikes 1–3 cm. diam., length 5–10 (–18) times diam., chestnut-brown (due to the great predominance of the brown stigmas at the surface). Male and female spikes contiguous or separated by up to 2 (–6) cm. Sheaths of the 2–4 uppermost leaves usually distinctly auriculate .... *T. orientalis*

1.* Bracts absent from the female inflorescence; stigmas narrow-obovate to obovate, ± flat and fleshy; female spikes blackish-brown or dark red-brown; pollen shed in tetrads .... *T. latifolia*

DISTRIBUTION

Our information on distribution is largely based on material in NSW, MEL, CHR, PERTH and ADW, as well as field studies in parts of New South Wales, Victoria, Tasmania and New Guinea.

T. domingensis is widespread in both eastern and western hemispheres, largely in warm temperate and tropical regions. It occurs in all mainland Australian States and Tasmania but is not known from New Zealand. It is chiefly found in the more inland parts of the eastern States and in northern Australia, often in small swamps subject to some degree of seasonal drying. In New South Wales it is represented in coastal districts (north, central and south) and from the Central Tablelands but is much less common than *T. orientalis* in these regions and is more frequent in inland districts.

T. orientalis has been collected in all Australian States but not in north-western Australia or in the Northern Territory. We have also examined specimens from New Zealand, Norfolk Island, New Guinea, and the Philippine Islands. In view of its occurrence as far north as Luzon in the northern Philippines, comparisons should be made with east Asiatic material to determine the limits of its range. It is the predominant species in the coastal districts of eastern and southern Australia, extending inland in New South Wales as far as the Western Slopes (also rarely the Western Plains) and into comparable situations in Victoria.

Mixed stands of *T. domingensis* and *T. orientalis* are frequent and show no evidence of hybridization.

T. latifolia is native in Northern Temperate regions and is naturalised at Scottsdale and (Dr. Winifred Curtis, pers. comm.) at other Tasmanian localities. It occurs at Faulconbridge (N.S.W.) but it is doubtful whether it is truly naturalised there.

CHROMOSOME NUMBERS

The chromosome number $2n=60$ has been recorded for *T. orientalis* from New Zealand by Roscoe (1927, as *T. angustifolia* var. *muelleri*) and more recently by Hair, Beuzenberg and Pearson (1967, as *T. muelleri*). There is also a report of this number for *T. angustifolia* (Heiser and Whitaker 1948) but the documentation of this count is inadequate. All other published counts are of $2n=30$, which has been found in *T. angustifolia* and *T. latifolia* (various authors in both Europe and America) as well as *T. domingensis* (Smith 1962, Californian material). Counts under *T. angustata* (Harada 1947, Gunguly 1959) may also refer to *T. domingensis*. In Japan $2n=30$ has been reported for *T. orientalis* (Harada l.c.) but it is doubtful whether this name is correctly applied to such Japanese plants. Graebner (1900) cited Chinese and Japanese specimens as *T. orientalis* but placed *T. orientalis* under *T. shuttleworthii*, a member of the ebracteate group, and omitted any reference to the

Type or other Philippine specimens. Material from temperate Eastern Asia has also been referred to *T. orientalis* by more recent authors, for example Ohwi (1965), but is described as ebracteate.

The results given in Table I and Fig. 2 were obtained from preparations of mitosis in very young female flowers or, in a few cases, rhizome buds or root-tips.

TABLE I—CHROMOSOME NUMBER DETERMINATIONS

Species	Locality		$2n$	Voucher Herb. NSW
T. domingensis	Limekilns, near Bathurst	N.S.W.	30	70321
	Box Hill, near Windsor	N.S.W.	30	77114
	Mansfield	Vic.	30	72744, 72747
	Ensay	Vic.	30	72746
	Tambo	Vic.	30	77116
	Scottsdale	Tas.	30	72726
	Montravel, Nouméa	New Caledonia	30	83922 (McKee 15840).
T. orientalis	North Richmond	N.S.W.	60	77121
	Dee Why	N.S.W.	60	72113
	Newington, near Parramatta	N.S.W.	60	72112
	Menangle	N.S.W.	60	96038
	Cobbanah	Vic.	60	72749
	Ludlow	W.A.	60	95264
	Wau	New Guinea	58–62	84790 (NGF 19473)
	Brown River	Papua	60–62	90660
T. latifolia	Scottsdale	Tas.	30	72719, 72722

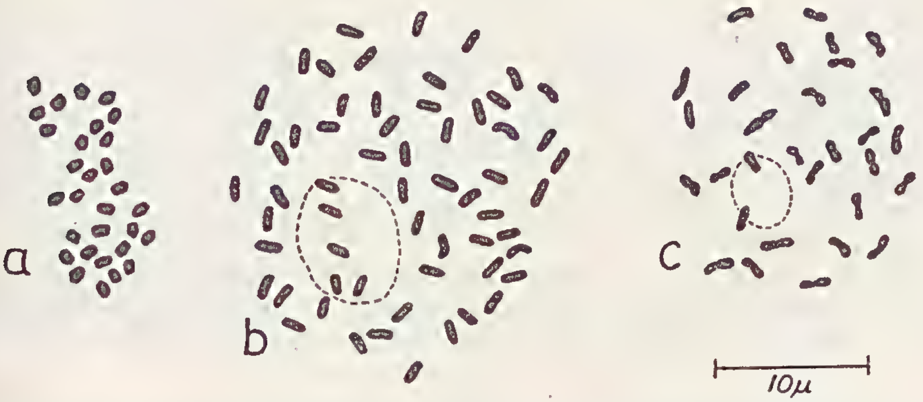

Fig. 2. Mitotic chromosomes. (a) *T. domingensis* $2n=30$ (NSW 70321). (b) *T. orientalis* $2n=60$ (NSW 77121). (c) *T. latifolia* $2n=30$ (NSW 72719). (a) metaphase, (b) and (c) late prophase, nucleoli still visible.

COMPARISON OF AUSTRALIAN AND EXTRA-AUSTRALIAN TAXA

The genus presents many problems that require critical re-investigation on a world-wide basis, and the affinities of the Australian plants cannot be fully clarified in the absence of a satisfactory generic revision.

T. domingensis, *T. brownii* and *T. angustifolia*

It appears that *T. angustifolia*, in a strict sense, is a species of North Temperate regions, although the name has been very loosely used by many authors. Crespo and Pérez-Moreau (1967) report the occurrence in Argentina of *T. angustifolia* which is confined to the Río Negro province (lat. ca. 40° S), in addition to *T. domingensis* and the newly-described *T. subulata* Crespo et Pérez-Moreau which are widespread. They provide descriptions and a key, including several useful features not generally stressed. The restricted distribution and recentness of the cited collections of *T. angustifolia* suggest to us that it might have been introduced in this region. Australian specimens which were included in this species (as a variety) by Melvaine differ from the Northern Hemisphere material in the shape and colour of the bracts of the female spike, in the pale ends of the anther connectives and in the less prominent leaf auricles. The late Dr. W. Rothmaler (in litt. 1961), referring to the Australian material, observed: "It seems to me that your *T. angustifolia* is not the European plant; perhaps it is *T. australis* (*domingensis*), as in the Mediterranean region, with the cinnamon-brown female spikes." He also drew attention to the need for a new world-wide treatment of the genus.

The earliest name in specific rank based on Australian or Malesian material is *T. brownii* Kunth which antedates *T. javanica* Schnizl. ex Rohrb. However, material from other parts of the world must also be considered.

Gèze (1910), when discussing *T. angustata* Bory et Chaub. (originally described from Greece) and its distinction from *T. angustifolia*, at first stated that he was struck by the resemblance between *T. angustata*, *T. brownii*, *T. javanica*, *T. muelleri*, and *T. domingensis*. Later (Gèze 1911, 1912), after studying extensive collections from many parts of the world, he recognised *T. domingensis* as a species widespread throughout the warmer parts of the world and included in it *T. australis* Schum. et Thonn. (type from West Africa), *T. angustata* and *T. javanica*. Apparently Gèze did not examine specimens of *T. domingensis* from Australia but his detailed description of this species would cover those Australian plants which have numerous broad bracts and narrow stigmas. Gèze was somewhat uncertain as to the status of *T. orientalis* but tended to equate this with *T. javanica* and thus include it in the preceding group. On the basis of a limited range of material examined, he was also undecided whether *T. brownii* and *T. muelleri* were separable but regarded these as distinct from *T. domingensis*. Despite uncertainty in assigning some synonyms to their correct position, Gèze clearly and appropriately characterized the species which he recognized and he appears to have had a better grasp of the situation than had many later authors. However, the varieties which he recognized within *T. domingensis* do not seem to be well defined and his subvarieties are not validly published.

Hotchkiss and Dozier (1949) also discuss the morphological distinctions between *T. domingensis* and *T. angustifolia* as well as their distributions in North America. These authors have been followed in several North American Floras (e.g. Fernald 1950, Munz 1959).

Backer (1951) included all material from the region covered by Flora Malesiana in *T. angustifolia*. In the material which we have examined from this area there are plants indistinguishable from *T. domingensis* in the Philippines and in New Guinea, while other plants have the features of *T. orientalis*, and there is no evidence that *T. angustifolia* s.str. occurs in the region. Similarly, in New Caledonia and Fiji the occurrence of *T. angustifolia* is reported (Guillaumin 1948, Parham 1959). We have examined material of *T. domingensis* from New Caledonia, but have not had specimens to determine which species are in fact represented in Fiji.

No consistent differences were found in comparing Australian specimens with material from the West Indies (the type area), Venezuela, Tunisia, Ethiopia, India, Timor, New Guinea, New Caledonia, and the Philippines.

T. orientalis and *T. muelleri*

The Type of *T. orientalis* and several other Philippine collections match the material from Australia, New Zealand and New Guinea which has been known by the more recent name *T. muelleri*. The Type is, however, a small plant with narrow leaves and particularly few bracts in the female spike, although well within the range of variation observed elsewhere. Material of *T. orientalis* from the Philippines and elsewhere in Malesia has had a diversity of treatments, being referred to *T. shuttleworthii* or *T. capensis* Rohrb. by Hallier (1914) and Merrill (1923), or included under *T. angustifolia* by Backer (1951).

These Australasian and Malesian plants have features largely similar to those of *T. glauca* Godr. of Europe and North America, of which we have examined specimens from France and from the Netherlands. Hotchkiss and Dozier (1949) describe features of *T. glauca* and appear to have regarded this as a species on the basis of its distinctive characters and extensive field occurrence.

However, in both Europe and North America many authors have considered *T. glauca* to consist of hybrids between *T. angustifolia* and *T. latifolia*. Graebner (1900) and Hegi (1935) accept this status for *T. glauca*; but the latter expresses some doubt, since it is said to be not uncommonly found in the absence of the presumed parental species, and because the leaf colour and large size of *T. glauca* are claimed to be distinctive. Graebner suggested that vigorous clonal spread of the hybrids could at times choke out the parents.

On the basis of a detailed study of Californian populations, Smith (1962) states that "*T. latifolia* hybridizes with both *T. angustifolia* and *T. domingensis* to produce easily recognized F_1 clones" which have been referred to *T.* ×*glauca*. Smith also reports that all of these are diploid. Roscoe (1927) had earlier reported on the meiotic behaviour of eastern North American plants (diploids) classed as hybrids between *T. angustifolia* and *T. latifolia*. Variation in similar material has been studied by Fassett and Calhoun (1952).

As *T. latifolia* is not native in the south-west Pacific, recent and recurrent hybridization cannot account for the Australasian and Malesian *T. orientalis* populations. These occur over a very extensive range, commonly in the absence of any other *Typha* species; moreover, plants sampled over a wide geographic range are tetraploid. The similarity to the Northern Hemisphere hybrids suggests the possibility of a remote allopolyploid origin from members of the *T. domingensis* and *T. latifolia* alliances. Dr. S. G. Smith (pers. comm.) has also suggested such an origin from hybridization between members of these groups.

It is not desirable to adopt the name of a presumably diploid hybrid for a self-maintaining tetraploid species. Consequently we consider that the name *T. orientalis* should be used for the south-west Pacific plants.

MORPHOLOGICAL FEATURES

Čelakovský (1885) and Kronfeld (1889) but the published descriptions in English are generally inadequate or inaccurate. Therefore the following account is given of the morphology of the family, comprising the single genus.

TYPHACEAE

Monoecious; the flowers unisexual, protandrous, wind-pollinated, very small and numerous, massed in two terminal superposed spike-like inflorescences. Spikes contiguous or more or less remote, the upper male and the lower female, each with a deciduous or rarely persistent leaf-like primary bract at the base, the male spike generally interrupted at intervals by 2–3 similar, very caducous bracts, discernible at maturity only by scars on the axis. Male inflorescence consisting of a central axis bearing naked "apparent flowers", generally interspersed with groups of hair-like bracts. Bracts non-vascularised, mostly not clearly associated with flowers, linear or somewhat spathulate; simple, laciniate or branched. Apparent flowers consisting of (1–) 2–4 (–7) stamens; filaments connate in the lower portion (with separate vascular strands), the free portion short; anthers basifixed, oblong, tetrathecate, opening by two longitudinal slits, the fleshy connective apex produced beyond the thecae, obtuse to subulate. Pollen grains shed singly or in tetrads. Female inflorescence cylindrical to ovoid, light to dark brown, the surface composed of densely packed stigmas, sterile gynoecia and apices of bracts and hairs, the aspect depending on the relative development and colour of these organs. Central axis bearing extremely numerous and crowded, very short, lateral axes (described as pedicels by most authors) which are thickened at the base and each of which bears one or several fertile or sterile flowers apparently maturing in acropetal succession, the lateral axes often apparently with minute subtending bracts and sometimes finally deciduous. Floral bracts about as numerous as the flowers or fewer or absent, without vascular tissue, consisting of an elongated hair-like proximal portion and a ± expanded lamina, at length deciduous. Fertile female flowers consisting of an axis (often interpreted as a gynophore) bearing hairs, terminating in the unicarpellary ovary which narrows into the single style. "Gynophore" slender, elongating with maturity, bearing in the proximal portion several tiers of long simple multicellular hairs (more than one cell thick) which are sometimes ± clavately expanded at the ends. Ovary fusiform, unilocular, with a single, pendulous, anatropous, bitegmic ovule. Style filiform, more or less expanded terminally into the unilateral, curved, linear to spathulate-obovate stigma. Sterile female flowers from few to about as numerous as the fertile flowers and interspersed among them, similar to the latter except for the gynoecium. Sterile gynoecia of two kinds, the first similar to the fertile ones but with the ovary and ovule imperfectly developed, the second modified into a subterminal clavate carpodium ending in a short style without expanded stigma. Fruit a follicle; pericarp membranous, dehiscing by a longitudinal slit, dispersed by wind and water with the stigma, gynophore and hairs still attached. Seed fusiform, the hilar end truncate, the other end acute; seed-coat of two layers, the outer consisting of elongated cells with thin longitudinal walls which collapse when dry so that the thickened transverse walls form minute projections, the inner layer thick-walled. Endosperm farinaceous, embryo straight, radicle superior.

Perennial, marsh herbs, usually robust, with a creeping, sympodially branched rhizome covered by distichous cataphylls, the branches terminating in erect aerial shoots. Shoots clothed at the base by transitional short-bladed leaves and above with fully developed foliage leaves, generally ending in the scapose inflorescences. Leaves distichous, the lower portion a long, open sheath closely enveloping the stem, upper sheaths often ± auriculate; laminae linear, elongate, obtuse to ± acute, from semi-cylindrical to flat, or sometimes keeled beneath. Vegetative parts (except the scape) aerenchymatous.

The following features of the inflorescence are relevant to its interpretation: The primary bracts of the female and male spikes continue the distichous phyllotactic sequence. Along the axis of the inflorescence, on the side opposite the insertion of each subtending primary bract, is a narrow flower-free line. This is devoid of flowers at the top and bottom but is more or less obscured for most of its length and often not distinguishable even in tranverse sections of the spike. The fertile surface of the scape in the region of the female inflorescence is covered by a slight cushion-like thickening from which the lateral axes arise. This thickening does not cover the region between the top of the female spike and the base of the male inflorescence.

On the floriferous cushion of the female inflorescence, along its upper and lower margins, a fringe of minute tapering bracts is sometimes visible. Similar bracts can often be seen in very young stages among the primordia of the developing lateral axes. The primary bracts of the male inflorescence may be regarded as dividing the central axis into several internodes. The sequence of flowering within each internode is basipetal, but the uppermost internodes are the last to mature. As a result, the flowers immediately above and below one of the primary bracts differ considerably in stage of development.

The inflorescence of *Typha* has sometimes been regarded (Čelakovský 1885, Kronfeld 1889, Velenovský 1905) as phylogenetically developed from an axis on to which are fused a series of lateral floriferous branches, the basal one (or rarely two) being female, the several upper ones male, each subtended by a primary bract. A study of the very earliest developmental stages may throw further light on the question; however, at the stages at which the inflorescence is readily examined, even when still concealed by the leaf sheaths, the fusion appears complete. This interpretation appears to be consistent with the observed morphology, particularly with the arrangement of the primary bracts and the sequence of flowering. The flower-free line would thus represent the margins of an enveloping fused branch system.

The degree to which each axillary unit is itself compound and the type of branching system from which it is derived are both uncertain, because of the considerable modification that has occurred. The male spikes, unlike the female, show no definite lateral branches; it is uncertain whether they are also reduced from compound systems and whether the "apparent flowers" are thus compound structures.

The bracts of the female inflorescence have often been described as bracteoles, but since they appear to subtend individual flowers we have followed the practice of those authors who treat them as floral bracts. It is uncertain whether the "bracts" of the male inflorescence are homologous with these. The flowers of both sexes appear to be highly reduced, and only the essential organs are vascularised. The "gynophoric" hairs of the female inflorescence have sometimes been regarded as representing a perianth, presumably homologous with the structures so interpreted in *Sparganium*. On the basis of developmental studies, Schaffner (1897) reported that these hairs "are entirely epidermal in origin, and are produced in acropetal succession, being irregularly arranged on the axis" and concluded that "it is not at all probable that such irregular epidermal appendages represent reduced perianth structures". The correct interpretation remains uncertain, and indeed the floral structure may bear little relation to the "classical" concept of the flower. It is similarly uncertain whether the "gynophore" is correctly interpreted as such, or whether it is more or less equivalent to a floral axis.

Engler (1887), Kronfeld (1889), Graebner (1900) and others have considered the Typhaceae, Sparganiaceae and Pandanaceae as being closely related. Other authors, for example Hutchinson (1959), consider that any resemblance of the Pandanaceae to the other two families is superficial and not due to real relationship. Interpretations of the morphology of the Pandanaceae by Vaughan (1953) and Holttum (1966) support this latter view, with which we also agree. Holttum considers the Pandanaceae to be related to the Palmae.

The limited information on chemical constituents (Hegnauer 1963) shows fairly good agreement between the Typhaceae and Sparganiaceae but no indication of close affinity between these and the Pandanaceae. Chromosome numbers recorded for the first of two of these families appear to be based on $x=15$. In *Pandanus* there are reports of $2n=60$ (Harada 1947, Gunguly 1959) but variation in number is reported in several species with counts ranging from $2n=51$ to $2n=64$ (Skottsberg 1955, Stone 1961). In all these families the chromosomes are approximately similar in size. Mallick and Sharma (1966) report $2n = 60$ in four species of *Pandanus* and $2n = 30$ in *Typha elephantina* Roxb. and *T. angustifolia;* from the locality (Calcutta) it seems likely that the latter species may actually be *T. domingensis.* These authors consider that their cytological findings show close affinities between Pandanaceae and Typhaceae. They recognize four morphologically distinctive chromosome types in *Pandanus* karyotypes and suggest that three of these correspond with similar chromosomes in *Typha.* In our preparations of *Typha* we could not confidently recognize chromosomes of the morphological types distinguished by Mallick and Sharma.

If the distinctive chromosomes are homologous throughout, as implied certain chromosomes must have remained constant in morphology over a very long period whilst changes occurred elsewhere in the complements. Despite maintenance of a constant basic number, different numbers of the distinctive chromosome types are recognized by Mallick and Sharma in different species of each genus. Thus there does not in fact appear to be a simple correspondence in karyotype between *Typha* and *Pandanus* and, in view of the very considerable differences between the families over a wide range of morphological characters, we consider it more likely that such cytological similarities as do exist are fortuitous. A comparative embryological study of the three families does not appear to have been made, but Maheshwari (1950) refers to similarities in the type of anther tapetum in *Typha* and *Sparganium.* He also described migration of the nucellar nuclei into the embryo sac in *Pandanus,* an unusual feature not reported in the other two families. The available embryological information, summarized recently by Davis (1966), is insufficient for a critical assessment of affinities. The pollen grains of *Typha* and *Sparganium* are very similar but differ from those of the Pandanaceae (Erdtman 1952).

Similarities between *Typha* and *Sparganium,* each the sole genus of its family, include: rhizomatous, helophytic habit; distichous phyllotaxy; flat rather than ensiform leaves with open sheaths; monoecious condition; scapose inflorescence with branch inflorescences subtended by distichous leaf-like primary bracts, the females below the males, with a more or less pronounced tendency for adnation of the inflorescence axis to the primary axis; flowers wind-pollinated and apparently reduced; anthers tetrathecate, basifixed, opening by two slits; female flowers unicarpellary (rarely bicarpellary in *Sparganium*) with elongated style and lateral stigma, the single ovule pendulous and anatropous; seed with thin testa, farinaceous endosperm and straight embryo.

Many of these characters are found frequently in monocotyledons and their common possession is not necessarily of great significance. However, the possession of many features in common, including some unusual and apparently homologous specialisations, strongly suggests a close relationship. Metcalfe (1963) states that "leaf anatomy provides convincing evidence that Sparganiaceae and Typhaceae are related to one another".

It is evident that, on the interpretation of the inflorescences of *Typha* outlined above, there is a stronger conformity of structures with those of *Sparganium* than is apparent at first sight. Nevertheless, in *Sparganium* the flowers appear to be borne directly on the branch axes, and it differs from *Typha* in the presence of a vascularized perianth. The differences in fruit between the two genera are associated with the mode of dispersal. The fruits of *Typha,* with their gynophoric hairs and thin pericarp, are largely wind-dispersed. Those of *Sparganium* are much larger, generally with a thick aerenchymatous pericarp, and are presumably water-dispersed.

We consider that the best treatment is that adopted by those authors (e.g. Hutchinson 1959) who recognise an order Typhales, consisting of two families Typhaceae and Sparganiaceae; the Pandanaceae are not regarded as close to these. It is not clear where, among other monocotyledonous families, the closest relationships of the Typhales lie. *Typha* and *Sparganium* are reduced and highly advanced in some characters although fairly generalised in others, for example in the form of the anther. Hutchinson (l.c.) suggests that they are derived from a Liliaceous stock and perhaps from the same stock that has given rise to the Xanthorrhoeaceae. In view of the uncertainty as to the interpretation of the flower, little can be said on the first point. It may be noted that the stomatal apparatus in the Typhales, which normally have two subsidiary cells, differs from that in the Liliaceae proper (and many allied families) in which there are no subsidiary cells. For a discussion of the importance of this feature in the monocotyledons see Stebbins and Khush (1961). We can see no reason to associate these families particularly with the Xanthorrhoeaceae. The resemblance of the latter to the Typhaceae is extremely superficial and is apparently confined to the external aspect of the inflorescence in *Xanthorrhoea* and *Typha*. In any case, the Xanthorrhoeaceae, as generally defined, probably do not constitute a natural family.

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New Species in *Eleocharis*

L. A. S. Johnson and O. D. Evans

SUMMARY

Two new species are described and discussed: *E. blakeana* (series *Acutae*) from southern Queensland and *E. obicis* (series *Mutatae*) from far western New South Wales. The latter has not been collected since 1885.

In dealing with Cyperaceae for the Flora of New South Wales, investigation of the genus *Eleocharis* has shown that there are two unnamed species in eastern Australia which it is necessary to describe.

Eleocharis blakeana *L. Johnson et O. Evans,* **sp. nov.**

Holotype: Qld., 1 mile W of Yelarbon, L. A. S. Johnson and E. F. Constable 10.11.1954 (NSW 30740; Isotype in BRI).

Perennis, stolonifera. Rhizoma breve, horizontale adscendenteve. Culmi plus minusve dense caespitosi, erecti, 30–40 cm. alti, circiter 1 mm. diametro, teretiusculi vel in sicco planiusculi, transverse septati, regulariter striati costibus circiter 14 angustis; vaginae membraneae, purpurascentes, ore vaginae summae horizontali, firma, plus minusve castanea, truncata mucronataque. Spicula lineari-cylindrica, 1–2 cm. longa, 1.5–2.0 mm. lata, pallida; glumae ovato-lanceolatae, acutae, nervo mediano distincti, marginibus late membraneis hyalinibusque, parte media plus minusve rufobrunnescenti. Stamina 3; antherae lineares circiter 1·5 mm. longae appendicem minutam setaceam ferentes. Stylus trifidus. Nux flavescens vel straminea, nitens, biconvexa, anguste obovoidea, 1·4–1·5 mm. longa, circiter 0·7 mm. lata, angulis costatis, cellulis externis minutis; basis styli depresse pyramidalis, circiter 0·3 mm. longa, imo circiter 0·4 mm. lata; setae 6–8, arcte appressae, brunnescentes, ¼–¾ longitudinis nucis.

Stoloniferous perennial. Rhizome short, horizontal or ascending. Culms more or less densely tufted, erect, 30–40 cm. high, ca. 1 mm. diam., sub-terete or flattened when dry, transversely septate, finely and more or less evenly striate with ca. 14 ribs; sheaths membranous, purplish, the uppermost orifice horizontal, firm, brownish, truncate, mucronate. Spikelet linear-cylindrical, 1–2 cm. long, 1·5–2.0 mm. wide, pale; glumes ovate-lanceolate, acute, the midnerve distinct, the margins broadly membranous and hyaline, the central portion more or less coloured red-brown. Stamens 3; anthers linear, ca. 1·5 mm. long, with a minute setaceous appendage. Style 3-fid. Nut yellowish or straw-coloured, shining, biconvex, narrow-obovoid, 1·4–1·5 mm. long, ca. 0·7 mm. wide, the angles costate, the external cells minute; style base depressed-pyramidal, ca. 0·3 mm. long, ca. 0·4 mm. wide at the bottom; bristles 6–8, closely appressed, brownish, ¼–¾ as long as the nut.

Distribution: At present this species is known only from the type locality, where it was forming dense stands in depressions in heavy gilgai country, but it may be expected to occur elsewhere in southern Queensland and perhaps the adjoining parts of New South Wales.

From the material available it appears to be most closely allied to the members of Series *Acutae* S. T. Blake (1939), but the transverse septa of the culm immediately distinguish it from the other species of the series. Otherwise it is near to *E. pallens* S. T. Blake in the very short rhizome and densely tufted habit, the prominently longitudinally sulcate, slender and terete culms and the shape of the spikelet. It differs from that species principally in the larger number of ribs on the calm and the slightly longer and narrower nut, which has an occasional trace of a third angle.

From *E. cylindrostachys* Boeck. It differs mainly in the prominently sulcate, more slender culms, the more acute spikelets and glumes and the better developed appendage to the anthers. It is distinguished from *E. acuta* R.Br. by the lack of creeping rhizome and by the costate nut.

This species is named in honour of Dr. S. T. Blake, of the Queensland Herbarium, Brisbane, who has contributed so greatly to knowledge of the Australian Cyperaceae, and of this genus in particular.

Eleocharis obicis *L. Johnson et O. Evans*, **sp. nov.**

HOLOTYPE: N.S.W., Barrier Range, Ramsay No. 85, 1885 (NSW 20711).

Perennis, stolonifera. Rhizoma brevissimum. Culmi dense caespitosi, plus minusve erecti, circiter 30 cm. alti, circiter 1 mm. diametro, teretes, longitudinaliter striati; vaginae membraneae, laxae, venis distinctis, ore vaginae summae obliquo margine non incrassato. Spiculae herbaceae, lineari-cylindricae, 2–3 cm. longae, circiter 2·5 mm. latae, plus minusve acutae; glumae 20–30, subsquarrosae, oblongo-ellipticae, apice obtusae rotundataeque, 4–5 mm. longae, circiter 2 mm. latae, striatae costa mediana distinctiuscula, marginibus late membraneis hyalinisque circiter 0·5 mm. latis zona intramarginali brunnea. Stamina 3; antherae 2·5–3 mm. longae, lineares, minute apiculatae. Stylus trifidus. Nux 1·5 mm. longa, circiter 1·2 mm. lata, obovoidea infra medium attenuata et apicem versus in cervicem distinctam contracta, inaequaliter trigona angulis costatis, faciebus stramineis et foveis non profundis instructis, cellulis externis hexagonis in seriebus 15–20 verticalibus in facie lata dispositis; basis styli deltoidea, circiter 0·5 mm. longa lataque annulo recto; setae vestigiales quartam partem longitudinis nucis non excedentes.

Stoloniferous perennial with a very short rhizome. Culms densely tufted, more or less erect, ca. 30 cm. high, ca. 1 mm. diam., terete, longitudinally striate; sheaths membranous, loose, distinctly veined, the uppermost orifice oblique, not thickened at the margin. Spikelets herbaceous, linear-cylindrical, 2–3 cm. long, ca. 2·5 mm. wide, more or less acute; glumes 20–30, subsquarrose, oblong-elliptic, obtuse and rounded at the apex, 4–5 mm. long, ca. 2 mm. wide, striate, with a fairly distinct midrib, the margins broadly membranous, hyaline, ca. 0·5 mm. wide, with an intramarginal brown zone. Stamens 3; anthers 2·5–3 mm. long, linear, minutely apiculate. Style 3-fid. Nut 1·5 mm. long, ca. 1·2 mm. wide, obovoid, attenuate below the middle, narrowed into a distinct neck below the apex, unequally trigonous, the angles costate, the faces straw-coloured, the surface shallowly pitted, the external cells hexagonal, in 15–20 vertical rows on the broad face; style-base deltoid, ca. 0·5 mm. long and wide; annulus straight; bristles vestigial, less than ¼ the length of the nut.

DISTRIBUTION: This plant is known only from the original collection from the Barrier Range in the arid western interior of New South Wales, but it differs so clearly from its nearest allies that it has been considered worthy of specific rank. Collectors should seek it in appropriate localities in New South Wales and neighbouring States.

From the small amount of material available, *E. obicis* appears to find a place amongst the Australian members of the Series *Mutatae* Svenson (1929), as described by Blake (1939). It differs from *E. philippinensis* Svenson in the differently-shaped glumes, which have a very broad hyaline membranous margin, and in the unequally trigonous and costate nut with very much reduced, fragile, red bristles. There is also a difference in the hexagonal cells of the exterior surface of the nut.

From *E. nuda* C. B. Clarke it again differs in the shape of the glumes and in their very broad membranous margins, in the shape of the nut with the exterior hexagonal cells in a greater number of rows, and finally in the shape of the style-base.

The epithet is from Latin *obex*, *obicis*, a "bar" or "obstacle", referring to the Barrier Range.

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Notes on Australian Taxa of *Acacia*. No. 1

MARY D. TINDALE

Acacia pruinocarpa *Tindale*, **sp. nov.**

HOLOTYPE: Far Eastern Section, Giles, Pass of the Abencerrages, Rawlinson Ranges, ca. 80 km. W of the Northern Territory border, Western Australia, R. Hill No. 1353, 29.7.1964 (PERTH), located in the State Herbarium of Western Australia, South Perth. ISOTYPES: AD; NSW 101375.

Acaciae notabilis affinis, sed differt: capitulis in pseudoracemis, singulatim vel saepe binatim secus axem dispositis; phyllodiis 6·5–17 cm. longis, 0·6–2·9 cm. latis, basi abrupte contractis, glandula unica reniformi a basi phyllodii omnis supra petiolum ornatis; funiculo primum filiformi deinde in arillum pileiformem super seminis apicem incrassato, haud semen duplo cingenti.

Allied to *Acacia notabilis* but differing in the following ways: flower-heads in false racemes, borne singly or often in pairs along an axis, the phyllodes 6·5–17 cm. long, 0·6–2·9 cm. broad, the base abruptly contracted, bearing a single reniform gland at the base of each phyllode above the petiole, the funicle at first filiform then thickened into a pileiform aril over the apex of the seed, never encircling the seed in a double fold.

Shrub or tree 0·3–10 m. high, mallee-like, the bark dark grey and striated or dark and fibrous. *Branchlets* glaucos, glabrous, mainly smooth, angular at first, soon becoming terete. *Phyllodes* falcate or straight, linear to cultrate, coriaceous, thick, rigid, glaucous, 6·5–17 cm. long, 0·6–2·9 cm. broad, prominently l-veined, with the marginal nerves similar, rarely with a strong lateral vein from the base but not reaching the margin, the lateral veins reticulate, the base abruptly narrowed and unequal-sided, bearing a large reniform gland on the expanded side at the base near the thickened petiole, the apex obtuse or sub-acute, slightly emarginate or truncate. *Flower-heads* bright yellow, borne on false racemes singly or in pairs along a stalk arising in the axil of a phyllode, with 55 to 62 flowers in each head; peduncles 1–3·8 cm. long, glabrous, glaucous, ribbed. *Bracteoles* about 1·3–1·5 mm. long with a very slender, glabrous stalk and disciform or pyriform lamina densely clothed with golden hairs. *Bract* subtending and covering the young inflorescences, yellowish-fawn, densely and minutely pubescent on the outer surface, more or less broadly oblong, ca. 3 mm. long and 1·2–2 mm. broad, the apex broadly rounded. *Calyx* narrowly turbinate, composed of 5 sepals which are joined for up to $\frac{2}{3}$ of their length, later free or almost so, each sepal about 1·5 mm. long, with a whitish margin, the apical portion densely clothed with a tuft of golden hairs. *Corolla* about 2–2·3 mm. long, 5-lobed, the petals connate for up to $\frac{2}{3}$ of their length, glabrous, the margin papillose. *Filaments* of the stamens numerous, about 2·3–2·5 mm. long. *Anthers* bilocular. *Ovary* about 1–1·2 mm. long, dark red-brown, subsessile, elliptical-oblong, glabrous. *Style* glabrous, ca. 2·5 mm. long, dark red-brown, the stigma small. *Legumes* stipitate, coriaceous, cultrate to oblong, faintly penniveined, markedly glaucous, pinkish brown, red-brown or blue-grey, glabrous, convex over the seeds, otherwise flat, 3–10 cm. long, 0·9–1·7 cm. broad, not constricted between the seeds. *Seeds* black, glossy, almost orbicular or slightly pyriform, horizontally or obliquely placed in the legume, the funicle at first filiform and looped, later thickened into a pileiform aril over the apex of the seed, never encircling the seed, the areole faintly marked.

DISTRIBUTION: AUSTRALIA: Northern Territory and Western Australia.

FLOWERING PERIOD: October to early December.

LEGUMES: borne on the shrubs or trees from late June to late September, although there is one example in early February.

Specimens Examined: Northern Territory: 25½ miles NW of Mt. Doreen Homestead, small trees 8–10 ft. high, pods brown, common in deep red sand, associated with *Triodia pungens*, G. Chippendale 1.5.1958 (NT 4200; PERTH); Mt. Doreen, Limestone bore, tall shrub 12 ft. high, common G. Chippendale 2.1955 (NSW 101376; NT 1227); Coekatoo Creek, J. B. Cleland 8.1931 (NSW 47435); 37 miles NE of Lake Mackay, shrub 7 ft. high, foliage glaucous, common on plateau at top of outcrop of lateritic gneiss, G. Chippendale 16.6.1957 (NSW 101374; NT 3380); 9 miles W of Narwietooma, small mallee-like tree 10 ft. high, bark dark and fibrous, associated with *Triodia basedowii* and *Acacia aneura* on red sandplain, R. E. Winkworth No. 303, 8.6.1954 (CANB; PERTH); 50 miles SW of Mt. Leisler, Kintore Range, tree 20 ft. high, dark grey, striated, infrequent on deep red sand flat between sand dunes, D. J. Nelson No. 970, 12.3.1964 (NSW 101373; NT 10860); western end of Mt. Olga, tree to 5 m. high, A. S. George No. 4994, 12.7.1963 (PERTH).

Western Australia: near Coolawanyah Station, at Carronjinna Spring, Asbestos Creek, Hamersley Range, D. L. Serventy 27.10.1951 (PERTH); Pass of the Abencerrages, Rawlinson Range, ± 128° 17′ E, 24° 58′ S, D. E. Symon 4.8.1962 (AD 26317; PERTH); Blackstone Range, tree up to 12–20 ft. high, adjacent to the edge of the range, R. Crocker No. 148, 20.6.1956 (NSW 47433); Warburton Range Mission, M. de Graaf 10.1963 (PERTH); Gunbarrel Highway, 2 miles W of Warburton turnoff, on upland gravel plain, with open mulga and *Acacia*, spinifex groundcover, E. Bettenay No. 8.4, 7.1965 (PERTH); 13 miles W of Warburton Mission, shrub or tree to 6 m. high, with several stems, A. S. George No. 2958, 30.7.1961 (PERTH); Murchison Downs Station, 10 m. tree, S. J. J. Davies 26.9.1959 (PERTH); Boolardy Station, tree 8·5 m. high, S. J. J. Davies 3.12.1959 (PERTH); ditto, tree 20 ft. high, S. J. J. Davies 18.7.1959 (PERTH); between Wandarrie and Austin, tree to 25 ft. with fresh green foliage, rough bark and twisted trunk, in mulga country, N. T. Burbidge No. 4753, 10.12.1955 (CANB; PERTH).

A. pruinocarpa is one of several species commonly known as "gidgee", whereas it is called "tawu" by the Australian aborigines according to Mr. R. Royce, the Curator of the State Herbarium of Western Australia, South Perth. In this species the phyllodes, branchlets and especially the legumes are very glaucous, hence the choice of the latin epithet '*pruinocarpa*'.

The phyllodes of *A. pruinocarpa* bear a strong superficial resemblance to those of *A. notabilis* which is native to South Australia, although the gland is 3–5 mm. above the petiole in the latter species.

A. pruinocarpa is usually on deep red sand plains or on gravel plains, in association with *Acacia aneura*, "mulga", and other species of *Acacia*. There is often a ground cover of species of *Triodia*, "spinifex", especially *T. basedowii* and *T. pungens*.

This species was described at the request of the CSIRO.

Acacia brunioides *A. Cunn. ex G. Don*, Gen. Syst. 2 (1832) 404 ssp. **gordonii** *Tindale*, **ssp. nov.**

Holotype: 18 miles by road WNW of Windsor, New South Wales, straggly shrub 2–3 ft. high, flower-heads bright yellow, localized to a small area on top of monolithic-type rocks in dry sclerophyll forest, E. F. Constable No. 4932, 8.7.1964 (NSW 77485), located in the National Herbarium of New South Wales, Sydney, Australia. Isotypes: K; US; MEL; BRI; UC; PERTH; A; L.

Acaciae brunioidis ssp. *brunioidis* affinis, sed frutex usque ad 1·3 m. altus, phyllodiis asperatis, pilis patentibus albis et plerumque curvis tuberculis exorientibus; pedunculis pubescentibus.

Allied to *Acacia brunioides* ssp. *brunioides* but differing in the following ways: a shrub up to 1·3 m. high, the phyllodes asperous, with spreading, white and usually curved hairs arising from the tubercles; and the peduncles pubescent.

The structure of the flowers, legumes and seeds of the two subspecies is very similar but the phyllodes are smooth and glabrous in the type subspecies, and the peduncles are glabrous. In both taxa the phyllodes are irregularly verticillate on the branchlets.

A. brunioides ssp. *brunioides* is often a larger shrub than ssp. *gordonii*, since it ranges from 0·3 to 3 m. in height. The former occurs in south-eastern Queensland especially near Stanthorpe and Wallangarra but it has also been recorded from Tooloom Station which is about 24 miles from Acacia Creek in north-eastern New South Wales, whereas ssp. *gordonii* is found mainly on the Blue Mountains, although there is one record from Hornsby (a northern suburb of Sydney).

SPECIMENS CITED: NEW SOUTH WALES: Bilpin, 16 miles ca. NE of Mt. Victoria, Blue Mountains, straggly shrub 1 m. high, flowers bright yellow, in sclerophyll forest, sandstone, alt. 740 m., E. F. Constable No. 5003, 17.9.1964 (NSW 101384; K); near Bilpin, on large rocks, bare sandstone outcrop, E. Gordon, late 10.1961 or early 11.1961 (NSW 101389); ditto, E. Gordon 26.12.1964 (NSW 101413); 9 or 10 miles N of Faulconbridge, Blue Mountains, on a flat rock overlooking Grose Valley, the perfume of the flowers outstanding, A. Hawke 15.8.1963 (NSW 101387); northern end of fire trail, Linden, Blue Mountains, under tree cover in dry sclerophyll forest, shrub 3½ ft. high, more stunted in open sites, I. Bowden 10.1964 (NSW 101403); ditto, I. Bowden 17.8.1964 (NSW 101386); Hornsby district, A. H. Winter 9.1933 (NSW 101402).

This subspecies is named in honour of Mr. Eric Gordon who drew my attention to this rare taxon several years ago and provided material with flowers and mature legumes for my examination. It flowers from August to September, the ripe legumes occurring on the shrubs in late December.

There has been some confusion between *A. brunioides* ssp. *gordonii* and another small shrub which occurs in the Blue Mountains of New South Wales, since both taxa are characterized by irregularly verticillate, asperous phyllodes clothed with spreading curved hairs. This other dwarf shrub is *Acacia baueri* Benth. var. *aspera* Maiden et Betche in A Census of New South Wales Plants (1916) 90. However the flower-heads are much smaller in the latter, usually being composed of 10–14 flowers, instead of about 20 as in *A. brunioides*. In *A. baueri* var. *aspera* the legumes are dark brown, curved, 1–1·8 cm. long, 2–4 mm. broad and linear to narrowly oblong. There are usually 2 longitudinally placed seeds each with a convoluted aril which does not encircle the seed. *A. brunioides* ssp. *gordonii* is characterized by legumes which are blue-black, oblong, 3·5–5·5 cm. long, 0·9–1·4 cm. broad and with prominent reddish margins. There are 5–9 horizontally placed seeds in each legume, the aril being pileiform.

Acacia baueri *Benth.* in Hook. Lond. Journ. Bot. I (1842) 344.

Attention is drawn to this uncommon dwarf shrub, as further specimens should assist in the elucidation of its infraspecific taxa.

A. baueri var. *baueri* is characterized by regular whorls of 5–9 phyllodes along the stems. It occurs in low-lying coastal areas from south-eastern Queensland to Botany Bay, New South Wales. It has been collected in such localities as Beerwah, Byron Bay, Harrington, South West Rocks, Rose Bay and La Perouse. Specimens with pubescent phyllodes have been found scattered throughout the range of the type variety.

In *A. baueri* var. *aspera* Maiden et Betche the phyllodes are irregularly verticillate but the structure of the flowers and legumes is similar to that of the type variety. Var. *aspera* is apparently uncommon, being so far recorded only from the Kings Tableland and Wentworth Falls regions of New South Wales. The lectotype which is located in the National Herbarium, Royal Botanic Gardens, Sydney, was collected by W. Forsyth at Wentworth Falls in January 1907 (NSW 101405).

I collected an atypical specimen of *A. baueri* about 3 miles NW of Mt. Keira at the junction of the Wilton and Mount Ousley Roads in November 1965 (NSW 79133), in heathy regrowth on poorly drained land surrounded by dry sclerophyll forest of *Eucalyptus gummifera*, *E. sieberi* and *E. racemosa*. This specimen resembles var. *aspera* in having irregularly whorled, asperous phyllodes but the latter are glabrous.

Acacia obliquinervia *Tindale*, **sp. nov.**

HOLOTYPE: Mt. St. Leonard, 6 miles N of Healesville, Victoria, erect tree 9 m. high, flowers mid-yellow, sweet perfume, on slopes of mountain, alt. 930 m., in red basalt soil, frequent to abundant, in *Eucalyptus regnans* forest, E. F. Constable No. 5278, 26.10.1964 (NSW 78790). ISOTYPES: K; US; A; MEL; L; BRI.

Acaciae falciformis DC. affinis sed differt: pedunculis glabris et phyllodiis glandula unica reniformi 0·1–1·2 cm. a basi distanti sine vena decurrenti e glandula versus nervum medium ornatis; etiam a *Acacia penninervis* Sieb. ex DC. pedunculis 0·8–1 mm. latis et leguminibus caesio-brunneis dignoscenda.

Allied to *Acacia falciformis* DC. but differing in the following ways: peduncles glabrous and the phyllodes bearing a single reniform gland 0·1–1·2 cm. distant from the base, without a decurrent vein from the gland to the midrib; also to be distinguished from *Acacia penninervis* Sieb. ex DC. by the peduncles being 0·8–1 mm. broad and the bluish brown legumes.

Shrub or tree 1–9 m. high, the bark usually smooth and grey. *Branchlets* reddish or purplish, often glaucous, rather angular. *Phyllodes* very narrowly oblanceolate (over 6:1) to narrowly obovate (2:1) or very narrowly elliptical-cultrate (6:1) to elliptical-oblong (2:1), thick, coriaceous, straight or usually falcate, 5–17cm. long, 0·7–4·7 cm. broad, obliquely-sided, the midrib prominent and much closer to the upper margin, the base attenuated, the apex obtuse, broadly rounded or sometimes emarginate, terminating in a small mucro, bearing a single, mostly prominent, reniform gland 0·1–1·2 cm. above the base, the lateral veins reticulate and prominent, without a decurrent vein from the gland. *Flower-heads* bright yellow, with a strong perfume, globose (except oval in bud), composed of about 20–24 flowers, borne in racemes and panicles on zig-zagged axes, the peduncles glabrous, 0·5–5 mm. long and 0·8–1 mm. broad. *Bracteoles* 1–1·3 mm. long, red brown or black, peltate, dilated above and densely ciliolate, the pedicel long and clothed with white curled hairs. *Calyx* turbinate, about 0·8–1 mm. long, 5-lobed, the sepals connate for up to $\frac{4}{5}$ of their length, the lobes ciliolate or clothed with white curled hairs. *Corolla* about 2 mm. long, 5-lobed, the petals connate for about $\frac{1}{2}$ of their length, glabrous or clothed with few to numerous, white hairs, the margin of the petals papillose. *Filaments* of the stamens numerous, about 3·5–4 mm. long. *Anthers* bilocular. *Ovary* about 0·8–1 mm. long, fawn, subsessile, more or less oblong, densely clothed with somewhat appressed, whitish hairs. *Style* glabrous, about 1·2–2·5 mm. long, the stigma slightly expanded. *Legumes* stipitate, coriaceous, bluish brown, glaucous, cultrate (6:1) to oblong (2:1), glabrous, 4–15 cm. long, 1·4–2·5 cm. broad, flat except convex over the seeds, penniveined, with prominent margins, straight or occasionally constricted between 1 or 2 seeds. *Seeds* black, dull to glossy, oblong-elliptical, 5–6 mm. long, 3·5–4 mm. broad, horizontally placed in the legume, the funicle filiform at first, then thickened into a dark brown or black loop on top of the pileiform aril, the areole fairly prominent.

DISTRIBUTION: Central Tablelands (Mt. Werong-Kanangra region) and the Southern Tablelands of New South Wales, as well as being widely distributed in Victoria from East Gippsland to the Grampians.

ECOLOGICAL HABITATS: usually between 2000 and 5500 ft. alt., on mountain slopes or ridges, in wet sclerophyll forests or often in *Eucalyptus niphophila* woodland, sometimes forming dense scrubs, growing on granite, shale, slate or basalt, in clayey or poor shaly soils.

FLOWERING PERIOD: September to November.

LEGUMES: Mature legumes occur on the trees from December to January.

Specimens examined: New South Wales: Central Tablelands: Kanangra, occurring for miles throughout the forest area in clumps, never seeds, only suckers, W. Schipp 10.1966 (NSW 96642); between Kanangra Plateau and Boyd River, shrub 6–8 ft. high, R. Coveny 25.4.1967 (NSW 96643); Kanangra Walls, 12 miles from Jenolan Caves, W. F. Blakely 9.1900 (NSW 55240); Mt. Werong, W. F. Blakely & F. J. Ludowici 26.10.1940 (NSW 55237); 2 miles S of Mt. Werong, shrub 1–1½ m. high, flowers golden yellow, common in *Eucalyptus* forest on slaty ridge, B. G. Briggs 2.10.1965 (NSW 96641). Southern Tablelands: South side of. Mt. Coree, Brindabella Range, 15 miles WSW of Canberra, small straggly tree 15–20 ft. high, bark dark brown and very rough, occasional in sheltered spots on mountainside, 4100 ft. alt, E. F. Constable 3.5.1958 (NSW 44254; K); Bimberi Range between Mts. Franklin and Ginini, Cotter River District, in eucalypt woodland on rocky slope, ca. 4900 ft. alt., low shrub to 4 ft. tall, foliage ± erect, glaucous green, flowers bright yellow, R. Pullen No. 3852, 3.10.1963 (NSW 96703; CANB); Brindabella Range, near Mt. Franklin, alt. ca. 1500 m., fairly common in wet sclerophyll forest, ca. 3 m. high, erect shrub, flowers bright yellow, R. D. Hoogland No. 6281, 11.11.1956 (NSW 96704; CANB); Granites Lookout, near Batlow, alt. approx. 4500 ft., granite, shrub 8 ft. high, with dense foliage and oval crown, D. J. McGillivray No. 1021, 7.12.1960 (NSW 96659); Bago Timber Reserve, Batlow, a shrub 4–10 ft. high, grows in dense scrubs on the high grade soils, 4000 ft. alt. and over, W. A. W. de Beuzeville 3.1917 (NSW 96693); ditto, 10.1916 (NSW 96691); Laurel Hill, Tumbarumba, P. Murphy 4.1927 (NSW 96692); on the slopes of Mt. Gingera, small tree 6–7 ft. high, ca. 5000 ft. alt., M. Tindale 16.1.1954 (NSW 96689); between Mt. Ginini and Mt. Gingera, alt. 5200 ft., in sparse snow gum forest, frequent, shrub up to 3 m. high, stems reddish, flowers bright lemon yellow, with unpleasant odour, L. G. Adams No. 1603, 30.10.1966 (NSW 96706; CANB); Rules Point Road, about 17 miles NE of Rules Point, on Fiery Range, shrub 3–8 ft. high, occasional small stands in *Eucalyptus* forest, about 4500 ft., T. and J. Whaite No. 2892, 5.10.1965 (NSW 96665); eastern side of Bimberi Range, near Blackfellows Gap, Cotter River District, in eucalypt forest on steep terrain, alt. ca. 5000 ft., common low shrub on steep shale slopes, flowers golden yellow, R. Pullen No. 2335, 4.11.1960 (NSW 96707; CANB); Kiandra, E. Cheel 23.10.1932 (NSW 96698; US; A; K; L); Gravel Pit 3, New Chum Hill, Kiandra, colonizer of old diggings, M. E. Phillips No. 3638, 11.3.1960 (NSW 96663); 6 miles E of Kiandra in *Eucalyptus delegatensis* forest with few shrubs, shrub 4–6 ft. high, leaves glaucous, N. T. Burbidge No. 3806, 26.2.1952 (NSW 96667; CANB); Tumut Pond, J. C. Newman, prior to 21.12.1951 (NSW 96662); Tolbar Road, near Happy Jack's Plain, ca. 15 m. SE of Kiandra, under snow gums, J. W. Vickery 22.1.1958 (NSW 96697); about 3 miles NW of Badja Mill, S of The Bald Mountain, shrub about 2 m. tall with smooth grey bark on trunk, growing on ridge top in poor shaly soil, A. Rodd 4.10.1964 (NSW 96656); Nimmo, near Adaminaby Dam, marginal dry sclerophyll forest, J. Raeder-Roitzsch & M. E. Phillips No. 2904, 10.5.1957 (NSW 42192); Tinderry Range, E of Michelago, 1400 m. alt., shrub 1·5 m. high, in crevice of granite rocks, stems red with waxy coating, phyllodes light green, flowers yellow, H. S. McKee No. 7554, 6.11.1960 (NSW 96660); Granite Mountains, near Geehi, W. Bateman 8.5.1963 (NSW 96668); Mt. Kosciusko, up to 5500 ft. alt., J. H. Maiden, 1.1898 (NSW 96669); Thredbo River, Mt. Kosciusko, J. H. Maiden & W. Forsyth 1.1899 (NSW 23662); near Dead Horse Gap, in snow gum woodland, M. E. Phillips & J. Raeder-Roitszch No. 2914, 3.10.1957 (NSW 96657); upper eastern slopes of Brown Mountain, abundant shrubs by roadside in wet sclerophyll forest, alt. ca. 4000 ft., up to 2 m. tall shrub, flowers bright yellow, fragrant, P. J. Darbyshire No. 1221, 2.10.1963 (NSW 96658); Pilot Tin Mine, S of Kosicusko Plateau, alt. ca. 4500 ft., K. Rogers 29.1.1961 (MEL 16500).

Victoria: Mt. Pinnibar, near Corryong, far north-east, at ± 3000 ft. alt., M. E. W. Stump 3.9.1962 (MEL 16501); near falls on Wulgulmerang Creek, at ± 2000 ft. alt., far east, K. C. Rogers 2.10.1960 (MEL 16527); on the Bonang Highway below Mt. Brown, 49 miles from Orbost, here shrubby only, not arborescent, up to 10 ft., W. Hunter 8.1944 (MEL 16529); about 10 miles up the road from Bright to The Chalet, Mt. Buffalo, ca. 2800 ft. alt., foliage not as glaucous as in trees near the summit, tree 20 ft. high, others 6–20 ft. high, with smooth grey bark, on mountain slopes in eucalypt forest, M. Tindale 27.3.1963 (NSW 96653); Mt. Buffalo, near The Chalet, tree 12 ft. high (ranging from 6–20 ft. high), foliage very glaucous, bark grey and smooth, very common, M. Tindale 27.3.1963 (NSW 96645); The Monolith, Mt. Buffalo, 4500 ft. alt., diffuse shrub 6–10 ft. high, in *Eucalyptus niphophila* scrub, B. G. Briggs 23.12.1952 (NSW 55241); Eurobin Falls, Mt. Buffalo, 2000 ft. alt., tree 20 ft. alt., in tall eucalypt forest, moist situation, B. G. Briggs 24.12.1952 (NSW 96647); Mt. St. Bernhard, C. Walter 1.1899 (NSW 96649; MEL 16504); 17 miles S of Mt. Hotham on Dargo Rd., small tree 5 m. high, bark grey, in *Eucalyptus* woodland, B. G. Briggs 28.12.1964 (NSW 72259); 10 miles N of Dargo, near Mt. Ewen on Mt. Hotham–Dargo Rd., small tree 7 m. high, foliage glaucous, immature pods green with purple markings around the seeds, common in wet sclerophyll forest on steep slope, clayey soil, B. G. Briggs 28.12.1964 (NSW 72258); Omeo to Mt. Hotham, 4000–5000 ft. alt., R. H. Cambage No. 3694, 17.1.1913 (NSW 96648); mountains 3000–5000 ft. alt., on the Macallister River, F. Mueller (MEL 16513); Wandong, 4 miles E of railway station, P. R. H. St. John 9.9.1912 (MEL 16531); West Kingslake, P. R. H. St. John 29.12.1929 (MEL 16540) and 18.9.1927 (MEL 16541); Acheron Way, Donna Buang, A. J. Tadgell 1.1935 (MEL 16517); Warburton, Baker 12.8.1913 (MEL

16509–10); mountains of Roses Gap, Grampians, C. Wilhelmi 2.1857 (MEL 16538); Major Mitchell Plains, Grampians, abundant understorey shrub up to 6 ft. high, in stringybark forest on steep southern slopes at 2500–3000 ft. alt., J. H. Willis, 8.12.1962 (MEL 16502); Mt. William, Grampians in gully, J. Staer 4.1911 (NSW 96654).

For many years in Victoria *A. obliquinervia* was confused with *A. falciformis* to which it is closely related. Both species occur in that State, although the latter is much less common. *A. falciformis* may be readily distinguished by the golden hairs on the peduncles and by the decurrent vein from the marginal gland on each phyllode. *A. falciformis* ranges from South Eastern Queensland, the Northern to the Southern Tablelands, Northern to South Western Slopes, as well as from North to South Coast of New South Wales, to Victoria. It flowers more erratically than *A. obliquinervia*, as there are records for each month of the year. *A. falciformis* is often a much larger tree being up to 12 m. high.

Another closely allied species is *Acacia penninervis* which is distinguished from both the above species by having fawn-coloured (instead of bluish brown), strongly penniveined legumes. The peduncles are glabrous as in *A. obliquinervia* but more slender being 0·2–0·3 mm. broad. Unlike the latter species, but as in *A. falciformis*, there is a decurrent vein from the marginal gland on each phyllode. *A. penninervis* extends from Queensland, to the North Western Plains, the North and Central Western Slopes as well as the Northern to the Southern Tablelands of New South Wales but it has not been recorded from Victoria.

The axes are prominently zig-zagged in *A. obliquinervia* but more or less straight in the other two species. All three species are characterized by dark-coloured funicles forming a loop on top of the aril in the seeds.

ACKNOWLEDGMENTS

I wish to acknowledge with many thanks the loan of 24 specimens of *Acacia pruinocarpa* from the State Herbarium of Western Australia, South Perth, as well as an extensive range of material of *Acacia obliquinervia* from the National Herbarium of Victoria, South Yarra. My thanks are also due to Miss Isobel Bowden, Mr. E. Gordon and Mr. E. F. Constable for special collections.

New or Interesting Algal Records from Australia

VALERIE MAY

Our knowledge of the freshwater algae of Australia is very meagre. There have been a few papers concerning certain regions (e.g. by Playfair, West, Moewus, Phillipson, Prescott & Scott, Scott & Prescott), but on the whole the study of the freshwater flora in Australia is at a very early stage, and there is very meagre material for comparison. Similarly, there is relatively little known of our marine Cyanophyta. For this reason it seems useful to list in an Australian publication any adequately identified and cited specimens of these algae, as a basis for future work and comparison. Dr Francis Drouet, of The Academy of Natural Sciences, Philadelphia, Pennsylvania, U.S.A., has been particularly kind in identifying a specimen of Chlorophyta and a series of Cyanophyta specimens for me. It is with his approval that I record the following species which he has identified (det. Drouet), together with a few others. Unless noted otherwise, all specimens are in my personal herbarium, at the National Herbarium of New South Wales, Sydney, N.S.W., Australia.

AUSTRALIAN FRESHWATER ALGAE

CHLOROPHYTA

Pediastrum boryanum (Turp.) Menegh.

This species was prevalent and appeared as green flakes in small waves.

Western side of Lake Victoria, N of Rufus Creek, W of Wentworth, New South Wales, Valerie May 29.12.1966.

Stichococcus subtilis (Kuetz.) Klerck. (det. Drouet)

1. Green scrum on soil.

† Cave near Hawker, South Australia, Valerie May 12.1965.

2. In water.

Spring Gully Creek, Kuring-gai Chase, near Sydney, New South Wales, T.S. Barratt 12.1966.

CYANOPHYTA

Anabaena variabilis Kuetz. (det. Drouet)

On mud at edges of river and forming strands in water. Covered by water.

Nyngan, Bogan River, New South Wales, Valerie May 27.8.1964.

Microcoleus lyngbyaceus (Kuetz.) Crouan (as *Lyngbya aestuarii* (Mert.) Lyngb.) (det. Drouet)

Two collections, A. and B.

Chambers Gorge, Flinders Range, South Australia, Valerie May 12.1965.

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†Only sample was sent to Dr Drouet.

Microcoleus vaginatus (Vauch.) Gom. (det. Drouet)

Collection B.

Chambers Gorge, Flinders Range, South Australia, Valerie May 12.1965.

Nostoc commune Vauch. (det. Drouet)

On stone.

Bunyeroo Gorge, Flinders Range, South Australia, Valerie May 12.1965.

Schizothrix calcicola (Ag.) Gom. (det. Drouet)

Green scum on soil.

† Cave near Hawker, South Australia, Valerie May 12.1965.

Scytonema hofmannii Ag. (det. Drouet)

On orchid pots and roots in a glasshouse.

Sydney, New South Wales, E. Gordon 3.1966.

A second collection (not checked by Dr Drouet) was obtained also from pots in a glasshouse, with the report that this alga was controlled by routine spraying with the fungicide T.M.T.D.

Rydalmere, Sydney, New South Wales, T. Burpes 3.1966.

AUSTRALIAN MARINE ALGAE

CHLOROPHYTA

Halimeda tuna (Ellis & Soland.) Lamour. emend. Bart.

This species is known from Queensland, but the specimen cited below appears to be the first record, extending the range south to New South Wales.

Pipeclay Point, Arrawarra, New South Wales, Valerie May 1.1961.

CYANOPHYTA

Calothrix crustacea Schousb. et Thur. (det. Drouet)

†† Transect Station 36B. On Ironstone ridge.

Cape Banks, Botany Bay, New South Wales, Valerie May 3.1968.

Entophysalis deusta (Menegh.) Dr. et Daily (det. Drouet)

Under exfoliating sandstone rocks.

Clovelly, Sydney, New South Wales, G. Fielding 6.5.1964.

Microcoleus lyngbyaceus (Kuetz.) Crouan (det. Drouet)

†† Transect Station 36A and 48A.

Cape Banks, Botany Bay, New South Wales, Valerie May 3.1968.

Note this species is recorded also under the freshwater species.

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† Only sample was sent to Dr Drouet.

†† A transect running from Station 0 (well above high tide level) to Station 53 (below low tide level).

Oscillatoria brevis Kuetz. (det. Drouet)

High pool on ocean headland.

Cape Banks, Botany Bay, New South Wales, Valerie May 12.1966.

Oscillatoria lutea Ag. (det. Drouet)

†† Transect Station 36B. On Ironstone ridge.

Cape Banks, Botany Bay, New South Wales, Valerie May 3.1968.

Schizothrix arenaria (Berk.) Gom. (det. Drouet)

†† Transect Station OA. Dried mud at base of rock. Above high tide level.

Cape Banks, Botany Bay, New South Wales, Valerie May 3.1968.

Schizothrix calcicola (Ag.) Gom. (det. Drouet)

†† Transect Station OA. Dried mud at base of rock, above high tide level. Also Transect Station 36A.

Cape Banks, Botany Bay, New South Wales, Valerie May 3.1968.

Note this species is recorded also under the freshwater species.

Scytonema hofmannii Ag. (det. Drouet)

†† Transect Station 11.

Cape Banks, Botany Bay, New South Wales, Valerie May 3.1968.

Note this species is recorded also under the freshwater species.

RHODOPHYTA

Ceratodictyon spongiosum Zan.

This distinctive species occurs in Queensland, but a small piece forwarded with a collection from Point Cloates, extends the known range of the species a long distance westward.

Point Cloates, Western Australia. In jar of preserved material from Point Cloates.

Gelidiopsis intricata (Ag.) Vickers

This species is already known from Queensland (May, 1949), but the present record appears to be the first definite collection from Western Australia. Unfortunately the specimens from this unusual area were submitted without details of date of collection, etc.

Point Cloates, Western Australia. In jar of preserved material from Point Cloates.

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†† A transect running from Station 0 (well above high tide level) to Station 53 (below low tide level).

Lophosiphonia calothrix (Harv.) D.T.

New record to New South Wales. Previously known from Western and South Australia. This specimen agrees with Harvey's Alg. Aus. Exsicc. No. 178B, from King George Sound, Western Australia, as well as the description and illustration in Harvey's *Phycologia Australica* Pl. 185C.

††† On *Codium* sp. Long Reef, New South Wales, A.H.S. Lucas 11.1930. Labelled by the latter as possibly *L. calothrix.*

On shell. †† Transect Station 49.
On *Corallina* sp. †† Transect Station 49. } 5.1968.

On *Hormosira banksii* (Turn.) Decne. †† Transect Station 45A, 3.1968.

Cape Banks, Botany Bay, New South Wales, Valerie May.

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†† A transect running from Station 0 (well above high tide level) to Station 53 (below low tide level).

††† In Herbarium of A.H.S. Lucas.

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A Toxic Alga in New South Wales and Its Distribution

VALERIE MAY

SUMMARY

Anacystis cyanea (Kuetz.) Dr. et Dail. occurs seasonally in the waters of dams in many districts of New South Wales and is now recorded chiefly on and near the Central and South Western Slopes. Further cases of livestock mortality associated with this species are recorded. The presence of this alga does not necessarily result in mortality, especially if livestock are able to avoid high concentrations. Heavy growth and toxin production in this species seem to occur mostly from January to June (especially from March to May) in this State.

DISTRIBUTION

In 1966, McBarron and May recorded that *Anacystis cyanea* (Kuetz.) Dr. et Dail. had been found in isolated areas of New South Wales in sufficient quantity to kill livestock. Since then I have examined numerous samples of water from dams suspected of containing this poisonous alga, *A. cyanea* being found in many of these waters.

All districts of New South Wales from which I have received this algal species are shown in the accompanying map (fig. 1). The localities are as follows:—

Central Coast: Upper reaches of Warragamba Dam.
Northern Tablelands: Glen Innes.
Southern Tablelands: Braidwood.
North Western Slopes: Manilla.
Central Western Slopes: Trewilga, Alectown, Wyalong.
South Western Slopes: Cootamundra, Bethungra, Muttama, Illabo, Pleasant Hills, Holbrook, Burrumbuttock.
Western Plains: Brewarrina, Armatree, Warren, Tottenham, Condobolin.
Far Western Plains: Broken Hill.

When a series of collections has been made from one district, this is shown as a single record on the map. It appears that *A. cyanea* can occur in any part of the State, although it has been recorded from the coastal region at only Warragamba which receives its waters from valleys below the townships of the Blue Mountains.

The greater number of collections from the Central and South Western Slopes and nearby is perhaps significant. I have received samples of *A. cyanea* also from Ballan and Berrybank in Victoria, and there is a record from Somerset Dam, Queensland (Drouet and Daily, 1956). It is unlikely that a recently recognised pest, so widespread in this State as well as in many other parts of the world, will not be found to be widely distributed in other States.

TOXICITY

The toxicity of *A. cyanea* is known to vary. However, when the alga occurs as a heavy water-bloom, and livestock have no alternative drinking water, losses seem likely.

Stock losses have been definitely correlated with the occurrence of *A. cyanea* in the following areas: Bethungra, Burrumbuttock, Condobolin, Cootamundra and Illabo, in addition to those previously recorded at Armatree and Pleasant Hills (see fig. 1).

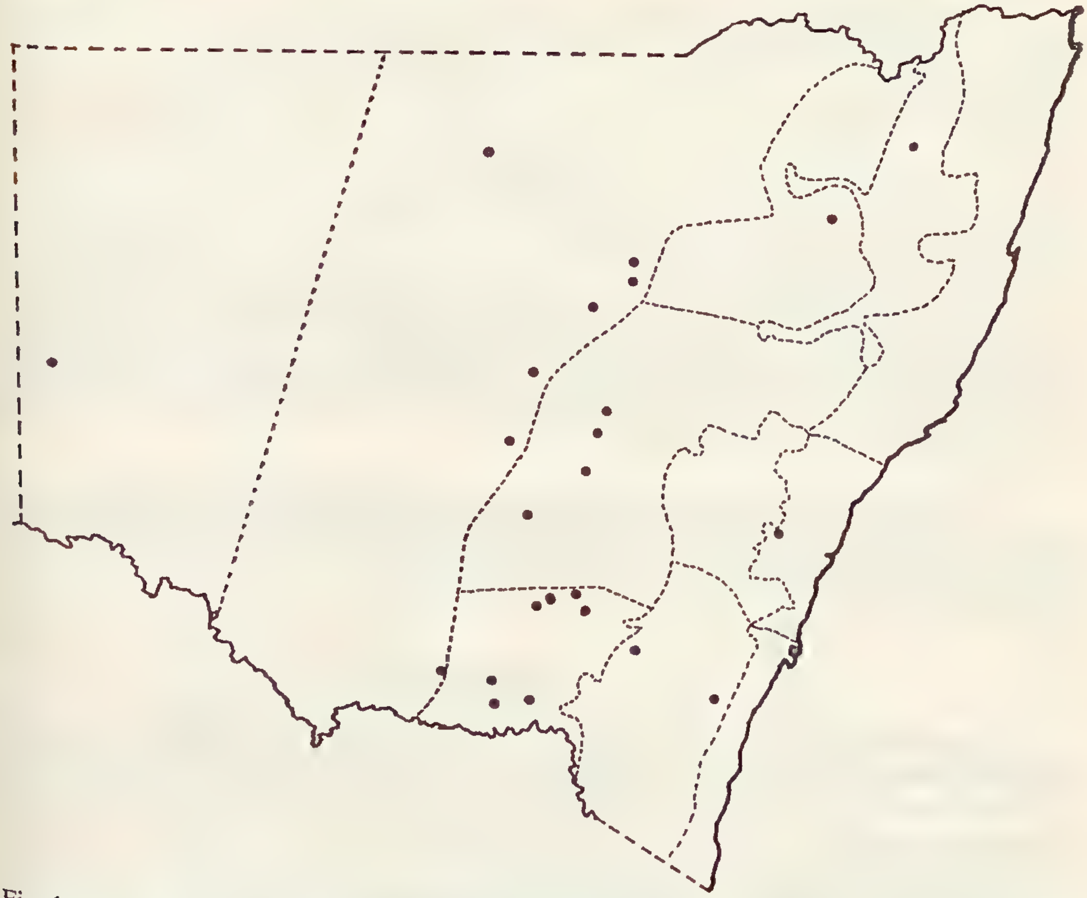

Fig. 1.—Map of New South Wales showing areas of occurrence of *Anacystis cyanea* (Kuetz.) Dr. et Dail.

It seems likely that some previously unexplained stock losses have been due to the undetected presence of *A. cyanea*, for example at Forbes, Gular, Oakland and Wee Jasper (which are included in fig. 1).

Sometimes, although the abundance of *A. cyanea* in a dam is not normally sufficient to cause mortality, losses can occur if wind concentrates the algae on to the side from which the animals must drink. Both sheep and cattle can be killed by *A. cyanea;* however, if both are present, sometimes only the sheep may be affected, possibly due to the cattle wading out beyond the densest concentrations of algae before drinking (as was observed on one occasion at Bethungra). Where the water-bloom is in a limited area, so that livestock are able to avoid it, they generally do so. On the other hand, turkeys have been known to peck at clumps of *Anacystis* (at Condobolin), following upon which their early demise was not surprising.

OCCURRENCE

In small concentrations *A. cyanea* occurs as a scum on water, but in areas where a full water-bloom has developed, the whole surface layer of water has the appearance of green paint, with a pale blue deposit of dried alga at the periphery of the dam.

When conditions are suitable, *A. cyanea* is able to increase in amount very quickly to form a dense water-bloom. Later, the water-bloom may disappear within as little as twenty-four hours; the residual amount of alga seems harmless until the next build-up in concentration. During the time of heavy infestation, the alga occurs in large clumps, with well-developed gas vacuoles in the cells and often associated with gas bubbles held in the mucilage matrix. The whole gives off a characteristic strong persistent odour. As an infestation by this alga disappears, the size of the algal clumps and the amount of associated gas bubbles both decrease markedly within a few hours.

As in other countries, *A. cyanea* water-blooms occur in late summer and autumn. Of the 31 dated collections (some duplicated) of dam water containing *Anacystis*, 13 were made in April, while 24 were obtained between March and May, and only one outside the January to June period. This one record (Braidwood, November) was noted as containing "old, broken colonies", there being no associated stock losses.

It seems that the active-growth, toxin-producing period of this alga in New South Wales is mainly from January to June, especially from March to May, and the waters of dams heavily infested by this alga at this time of year are likely to be hazardous to stock.

ACKNOWLEDGEMENTS

My sincere thanks are due to Mr E.J. McBarron, Principal Veterinary Research Officer, Glenfield, for continuous co-operation in this work, and also to the numerous Veterinary Field Officers who have submitted samples of water suspected of containing *Anacystis.*

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Some Observations on the Lemnaceae or "Duckweeds" of New South Wales

O. D. EVANS

SUMMARY

Biological studies of the members of the family Lemnaceae, "Duckweeds", from New South Wales are reported in preparation for taxonomic treatment for the Flora of this State. In *Wolffia* a second, possibly undescribed, taxon is shown to be present. In *Spirodela* three taxa are discussed, in one of which a solitary root is a feature. Observations are made on flowering and fruiting in the various genera and species. Adaptations for survival under adverse conditions are discussed and observations are recorded on branching of the frond under local climatic conditions. For the purposes of this investigation all cultures were made under near natural conditions in daylight and using rain water and tap water with the addition of a small amount of soil and leaf mould from beneath eucalypt trees.

In preparing the treatment of Lemnaceae for the Flora of New South Wales much preparatory work has been necessary, because of the scarcity of information available concerning Australian forms. Apart from the collections made by F. Mueller about 1866 and a little later, and the taxonomic work of Kurz (1867), Hegelmaier (1868, 1895) and Bentham (1878), only superficial attention has been paid to the family in this country.

The present study began in 1960 and was at first intermittent, but since the summer of 1965–66 it has been more intensive. Considerable variability in the vegetative features of the more common species of *Spirodela*, combined with the rarity of flowering and fruiting, has repeatedly frustrated hopes of arriving at definite taxonomic conclusions. Therefore cultures were made from almost all specimens received and in some instances these have been carried on for several years. Field studies have been made for the purpose of checking the information gained from cultures. A taxonomic treatment is being prepared in collaboration with Dr Hj. Eichler, Keeper, State Herbarium of South Australia, but as further work is necessary to complete this, and as the study has already been prolonged, it seems desirable to publish the information already gained.

It is emphasized that, until taxonomic study is complete, the nomenclature used in this paper is necessarily that in current use by Australian authors. Details of specimens cited herein as NSW numbers will be given in the later formal treatment.

Three genera of Lemnaceae are known to occur in New South Wales, or two only, if *Lemna* and *Spirodela* are considered to be congeneric. At the commencement of this investigation the character commonly used in Floras to distinguish between *Lemna* and *Spirodela* was as follows: — Root solitary on each segment of the frond, *Lemna*. Roots several, *Spirodela*.

Amongst specimens of the taxon which has appeared to be *S. pusilla*, mature fronds with a single root are often present, though Hegelmaier (1868) has described it as bearing two or rarely three roots. At first these single-rooted fronds were assumed to be those of a *Lemna* growing in association with the *Spirodela*. However, since these fronds are identical in all other respects with the remainder of those in the same collection, suspicion arose that this was not the case. It was possible to isolate fruiting specimens with only one root which were otherwise identical with the plants of *S. pusilla* (NSW 78944, Pl. I, fig. 1).

Kurz (1867) mentions 1 to 2 roots in his description of *Lemna melanorrhiza* (*S. melanorrhiza*) and Thompson (1897) refers to *S. punctata* with 1 to 3 roots.

In view of these points it is necessary to find some other key characters to distinguish New South Wales forms of *Spirodela* from *Lemna*.

The question of maintaining the generic distinction between *Spirodela* and *Lemna* will be discussed in the taxonomic study.

KEY TO THE GENERA OF LEMNACEAE IN NEW SOUTH WALES

1. Plants rootless, frond ellipsoid to subglobose, with a single basal reproductive pouch. Flowers breaking through the centre of the upper surface of the frond.......... *Wolffia* 1.

1.* Plants with 1 or more roots to each frond, frond distinctly flattened, with 2 lateral reproductive pouches. Flowers developing in the reproductive pouch.

  2. Root always solitary on each segment of the frond, and arising from a sheath at right angles to the undersurface .... *Lemna* 2.

  2.* Roots 1 or more on each segment of the frond and arising from a prophyllum which lies parallel to the undersurface .... *Spirodela* 3.

1. WOLFFIA

1. **W. arrhiza** (*L.*) *Wimm.* var. **australiana** *Benth.*

Prior to these studies this was the only taxon of *Wolffia* known to occur in Australia (Bentham 1878, Hegelmaier 1895). The first record for this continent is a collection made by F. von Mueller at Mt. Emu Creek, west of the Otway Ranges in Victoria in 1874. (NSW 77945). This plant is not uncommon in New South Wales, either alone and often forming a complete green covering on the surface of ponds or in association with other Lemnaceae. In common with some other members of this family it appears to flourish best in waters enriched by drainage from the surface of grazing land (NSW 78991, 98818) and from cattle yards (NSW 100202).

The mature frond is mostly 1·0 to 1·2 mm long, about half as broad as long and 1·0 to rarely 1·5 mm deep. The upper surface is raised and distinctly convex, uniformly green and shining, ellipsoid in outline (when viewed from above) and with rounded edges. Stomates are numerous, up to 100 having been estimated to occur on a single frond. Flowering and fruiting specimens have been collected during summer and autumn (NSW 56527, 78991, 98818).

During winter the fronds have been observed to sink and rest in the mud, appearing on the surface again in spring.

2. **Wolffia** sp.

In March 1961 a second taxon of *Wolffia* was found, associated with *Spirodela* in a collection made by E. F. Constable from a pond at Penrith, adjacent to the factory of the Nepean Dairy Company (NSW 53468, 54358). This is a much smaller plant than the more common species and, since it appears mostly to occur sparsely scattered amongst populations of *Spirodela*, it is perhaps not surprising that this *Wolffia* has been overlooked for so long. It has since been recorded on several occasions from the Murrumbidgee Irrigation Areas in association with *Spirodela pusilla* (NSW 78944, 78984). Only once has it been observed in the field in abundance, namely at Kellyville, near Sydney, in 1966 when it was causing a nuisance together with *Spirodela pusilla* in a farmyard "tank" receiving drainage from pig and cattle pens (NSW 78969, 78983). In culture from this last source the species has maintained its activity for 2½ years in continued association with the *Spirodela* (NSW 101903). In cultures of *Spirodela* from the Murrumbidgee Irrigation Area it has remained persistent but still only very sparsely scattered.

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* Frond measurements refer to dried material soaked for 1 minute in weak detergent.

The same taxon has since been collected in South Australia by Hj. Eichler and in North-western Australia by C. den Hartog. The mature frond is mostly 0·5 to 0·8 mm long and about the same in depth; the upper surface is flat, oblong-elliptical in outline as viewed from above, and sharply edged. The stomates are few, not exceeding 25 per frond. It can easily be distinguished by the upper surface, of which the central portion is pale and framed by the green margins. Flowering and fruiting specimens have been collected in summer and autumn (NSW 54358, 78983).

2. LEMNA

So far as is known at present, only two species of *Lemna* occur in New South Wales.

1. Fronds floating on the surface, singly or 2 to 5 together .... *L. minor* 1.

1.* Fronds submerged except when flowering, mother and daughter fronds usually remaining attached to each other by long attenuate stipes, often forming dense masses .... *L. trisulca* 2.

1. Lemna minor *L.*

The form of *L. minor* which occurs in New South Wales, is very small in size, i.e. 1 to 2 mm long and 1·0 to 1·5 mm wide. So far it has been recorded mostly from districts west of the Main Divide where it sometimes occurs in such abundance as to become a nuisance (NSW 83301). It flowers and fruits freely at times during summer months (NSW 79287, 83301, 84667, 97881). The fruits are 1-seeded, the seeds being 0·8 to 1·0 mm long, ellipsoid and ribbed (NSW 84465). They germinate readily in culture after a short period of drying. Within 14 days from sowing the seedlings (NSW 94694) closely resembled those figured by Hegelmaier (1868). Seedlings were also found in wild material, amongst flood debris of *Azolla* collected from a back flow of the Dumaresq River on the North-west Slopes of New South Wales (NSW 93055), after the break of a long spell of dry weather. It would thus appear that abundant fruiting is an important factor, enabling the plant to survive the periodic droughts which affect the interior of this State.

Whether or not this taxon is conspecific with the larger plant grown locally in aquaria is a further matter which may be considered when dealing with the taxonomy.

2. L. trisulca *L.*

L. trisulca has been collected in New South Wales from several localities, but there has been no opportunity in the present investigation to study it in the living state.

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* Frond measurements refer to dried material soaked for 1 minute in weak detergent.

3. SPIRODELA

Several taxa of *Spirodela* are found in New South Wales and may be distinguished as follows, subject to conditions discussed below.

1. Fronds from broadly obovate to elliptic, oblong-elliptic or slightly reniform, not very thick. Roots not exceeding 11 in number.
    2. Fronds not usually exceeding 3 mm long* and 1·75 mm broad. Roots on mature fronds 1–3, often 2–3, rarely 2–5 .... *S. pusilla* 1.
    2.* Fronds up to 5 mm long and 4 mm broad. Roots on mature fronds 2–8 (11).
        3. Roots constantly 2–4 (5) .... *S. oligorrhiza* var. *oligorrhiza* 2.
        3.* Roots sometimes increasing to 6–8 (11) ...... *S. oligorrhiza* var. *pleiorrhiza* 3.

1.* Fronds orbicular, thick. Roots up to 15 in number. In cultivation only *S. polyrhiza* 4.

The taxa of *Spirodela* vary considerably in response to external conditions, particularly in coastal districts, so that diagnostic features overlap to some extent (see below under "Frond Size"). The most constant feature distinguishing *S. oligorrhiza* from *S. pusilla* is the ratio of frond sizes, where the two species are growing under identical conditions either naturally or in culture (see below under "Mixed Communities"), Pl. III, fig. 1–2.

In *S. oligorrhiza* var. *pleiorrhiza* the increased number of roots is observable only when conditions are favourable to growth. No other reliable feature distinguishing this variety from var. *oligorrhiza* has so far been found.

It will be convenient to discuss these taxa jointly in terms of their diagnostic features and the variation therein.

Frond Size

The maximum length and breadth of the frond have proved useful to a limited degree. The taxon assumed to be *S. pusilla* was separated partly by this means. In collections received from the Murrumbidgee Irrigation Area in 1965–66 the maximum observed size of the frond was 3 mm × 1·7 mm, and it was further noticed that over a period of more than two years in culture no appreciable increase in size appeared in mature fronds (NSW 78944 Pl. I, fig. 1, 78984, 90977). Specimens received from other inland localities agreed closely with the above (NSW 84465, 84466, 94693). Material from the Sydney district and other centres of population included some larger fronds up to 4 mm × 2·5 mm (NSW 102448), leading to possible confusion with *S. oligorrhiza.* However, in each of the latter cases the waters in which the *S. pusilla* was growing were enriched by drainage from various sources such as abattoirs (NSW 53521, 95826) and suburban surface drainage (NSW 102448). The specimen (NSW 77956) cited by Hegelmaier (1895) is a similar example. It was collected from the "Waterloo Swamp, at the extreme end of Elizabeth Street, Sydney", where the water is known to have been enriched. This swamp has since disappeared with urban development.

Cultures made from these enlarged forms and grown in ordinary tap water and rain water soon become smaller in the fronds and indistinguishable from the normal form.

Considered alone, size of fronds in *Spirodela* may be misleading, because overcrowding and other adverse conditions lead to reduction in size, as illustrated by the following example. A specimen received early in this study from Pennant Hills (NSW 84468) had small fronds and seemed to match *S. pusilla* very well. The collector, on the basis of field experience, disagreed with this determination, so a culture was established. Within eight weeks strong new growth occurred, some of the new fronds showing an increase in length, breadth and number of roots (up to 7) (NSW 84649). This led to a redetermination as *S. oligorrhiza* var. *pleiorrhiza*. Subsequent experience has indicated that this case was somewhat unusual, in that the fronds were not only small but uniform in size. Moreover, it is possible that the community was a mixed one and further cultures would have been necessary to finalise the matter. (See below, under "Mixed Communities".)

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* Frond measurements refer to dried material soaked for 1 minute in weak detergent.

Nevertheless, subject to these limitations and in conjunction with consideration of other characters, size of frond was found to be of some use as a diagnostic character.

Frond Shape

The shape of the frond in outline is too variable to be of diagnostic value.

Frond branching

This feature was given some attention, because Kurz (1864) referred to it in his description of *S. pleiorrhiza*. In specimens collected from shaded situations (NSW 98363, 98576) or under conditions favouring rapid vegetative reproduction, branching from alternate sides of the frond was prevalent. However, under more normal conditions of sunlight in this country unilateral branching commonly occurs (e.g. NSW 94534, 94635, 98663). An experimental transfer from normal sunlight to shaded conditions was followed in about 14 days by a change from the unilateral condition to branching alternately from either side of the frond (e.g. NSW 98633, 98664). The converse experiment with material collected in a shaded situation led to a change to unilateral branching (e.g. NSW 98576, 84566).

Root number

The majority of specimens of *Spirodela* received from coastal districts of this State bear 2 to 4 (or rarely 5) roots and have in the past been determined as *S. oligorrhiza*. When cultured it is found that only some of these correspond with *S. oligorrhiza* var. *oligorrhiza* (e.g. NSW 82010, 98586, 98587, 98596, 102454, P. I, fig. 2). Several of these have been tested in culture for long periods and have not borne more than five roots. Some prove to be *S. pusilla*, with single-rooted fronds not in evidence. In such instances the small size suggests check by culture. Others may prove to be *S. oligorrhiza* var. *pleiorrhiza*.

Certain specimens (NSW 49443, 84650) received from various parts of New South Wales bear more than 5 roots, up to 8 or 9 in some cases, and exhibit much variation in root number both individually within the sample and also from time to time in culture.* These are, for the present, considered to be *S. oligorrhiza* var. *pleiorrhiza*. One case is of especial interest. A few fronds were collected in Parramatta Park, amongst litter left on the banks of the Parramatta River by a flood a day or so previously (NSW 81903). In culture the number of roots increased in some individual plants in a single chain from 2 to 8, accompanied by a marked increase in the size of the frond (NSW 94534). When small fronds selected from the crowded part of the culture were placed separately, they underwent a similar change. Some individuals in a crowded culture appeared to gain an advantage over the remainder and grow larger in this way (NSW 85763, 84204). At first the culture was suspected of being a mixed community but after two years the same characters were present. (See further notes under "Mixed Communities".)

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* In one culture root numbers up to 11 were found under favourable conditions of growth (NSW 103729).

Rootcap

The shape of the rootcap has not proved to be of any use. In most of the specimens observed it has been obtuse, with a small apical mucro of external tissue which may soon disappear. However in one specimen from the upper Nattai River (NSW 99911) the rootcap was uniformly acute and acuminate. Further observation proved that this was an unstable condition, which disappeared almost entirely in culture (NSW 100429). Critical examination of fresh material from other sources has revealed occasional examples of a similar nature, together with intermediate forms.

Flower and Fruit

Flowering and fruiting has been observed most frequently in *S. pusilla*. This is the more common species of the hot and drier inland areas of the State and it seems that free-fruiting is essential, as in *Lemna minor* (see above), to enable it to survive long droughts when surface waters disappear. In contrast, both varieties of *S. oligorrhiza* flourish in the Coast District where conditions favour vegetative reproduction all the year round, or at least the surface water seldom completely dries up. Fruiting under these conditions is thus not usually essential for survival.

Fruiting in *Spirodela* was first recorded in New South Wales in a specimen of *S. pusilla* (NSW 80025) collected by E. J. McBarron at Picton in January 1966 but has since been found in herbarium specimens of earlier date. At Picton the fronds were growing in seepage on a rock face, a situation unfavourable to vegetative reproduction.

Flowering is occasionally found in *S. oligorrhiza* var. *oligorrhiza* but no Australian occurrence of fruiting plants had been reported until fruits were found in a culture at Eastwood in March 1967 (NSW 98596). The fruits in this specimen scarcely projected beyond the margin of the frond. They were only noticed because of the presence of fine filamentous algae attached to the wall of the fruit and projecting outwards. Very close observation was necessary to collect sufficient for one or two herbarium sheets. It differed in this respect from *S. pusilla* in which about one third of the fruit protruded beyond the margin (NSW 94696).

Fruiting has since been observed in *S. oligorrhiza* var. *pleiorrhiza* (NSW 103113). The fruit in each of the above taxa is 1-seeded. The seed is ellipsoid, slightly oblique, ribbed, 0·8 to 1·0 mm long and lies parallel to the longitudinal axis of the frond, apparently arising from an amphitropous ovule. The spathe is open on one side, and in general the flowering and fruiting stages conform very closely to those figured for *S. oligorrhiza* by Mason (1967). Flowering occurs from October onward and fruiting in *S. pusilla* from December to April.

Adaptations for Survival under Adverse Conditions

Reference has already been made to some aspects of this subject in several places above. The tenacity of life in the frond is of some interest in this regard. Cultures can be made from green material that has suffered drying for a short period in transit (NSW 82011, 100381) and also from material apparently ruined and dead from bacterial action (NSW 94581, 84386).

It appears that there is a minute growing point in the frond which is a focus of resistance to desiccation and decay. From it arises a tiny rootless frond which at first might be mistaken for *Wolffia* (NSW 100381).

There is some evidence that this is a factor in survival under adverse conditions in the field. Mr G.R. Sainty reports concerning a specimen collected in winter from the margin of a swamp in the Murrumbidgee Irrigation Area near Griffith (NSW 100382). "Duckweeds occur prolifically in this swamp through the summer. On date of collection (1st August 1968) very few plants could be seen on the surface of the water; some were mixed with *Azolla* sp. There have been very heavy frosts in this area over the last few weeks. The fronds of duckweed (*S. pusilla*) could be seen floating under the water or in the mud. Some were green and had roots attached but many others were rootless and the undersurface dark reddish brown. Others lodged in the mud were not green and appeared lifeless."

Examination of a number of these apparently lifeless fronds revealed the presence of a small germ of living tissue, whitish in colour corresponding to the description given above. From the mud collected on this occasion a flourishing culture appeared in early summer (NSW 102443).

Mixed Communities

Various examples of mixed communities and of the occurrence of two taxa in the same stream or pond have been found.

Specimens of *Lemna minor* forwarded from western districts have contained a small percentage of *Spirodela pusilla* (NSW 84385, 84386, 94580, 94581).

In the following instances where *S. pusilla* and a larger taxon have been collected from the same waters, *S. pusilla* has been dominant. In a collection of *S. pusilla* from Deniliquin (NSW 84466, Pl. II, fig. 1), a few fronds of a larger form were noticed. When cultured these proved to be *S. oligorrhiza* var. *pleiorrhiza* (NSW 84650, Pl. II, fig. 2). In the George's River district, south from Liverpool, *S. pusilla* is very abundant in summer, forming a green carpet over the surface of two tributaries of the river (e.g. NSW 81665, 85467), yet lower down, near the weir at Liverpool, both this species and *S. oligorrhiza* var. *pleiorrhiza* have been collected, the latter in small quantities (NSW 91467).

In 1966 a small collection was brought from the upper Nattai River, west of Mittagong, later producing in culture some fronds with 5 to 7 roots (NSW 78997, 94571). More recently collections were made on four different occasions from this place for the purpose of securing a fresh culture of this form, but in each case the populations were composed of *S. pusilla* with only a very small trace of the larger taxon and that in two collections only.

Whether *S. oligorrhiza* var. *oligorrhiza* is also weaker than *S. pusilla* has not been ascertained.

ACKNOWLEDGEMENTS

I wish to thank Dr Hj. Eichler, Keeper, State Herbarium of South Australia, for very valuable advice and encouragement. I am much indebted also to Mr L.A.S. Johnson of the National Herbarium of New South Wales for helpful criticism and discussion.

I have been much assisted in securing living specimens by Mr E.F. Constable, formerly Botanical Collector at the National Herbarium of New South Wales; by my colleague Mrs A.T. Lee who has very kindly made repeated collections from the Upper Nattai River and Mr G.R. Sainty, Weeds Officer, Water Conservation and Irrigation Commission, Murrumbidgee Irrigation Area, Griffith.

To Mr E.J. McBarron of the Glenfield Veterinary Research Station I am deeply indebted for the supply of duplicate herbarium specimens and for the loan of others.

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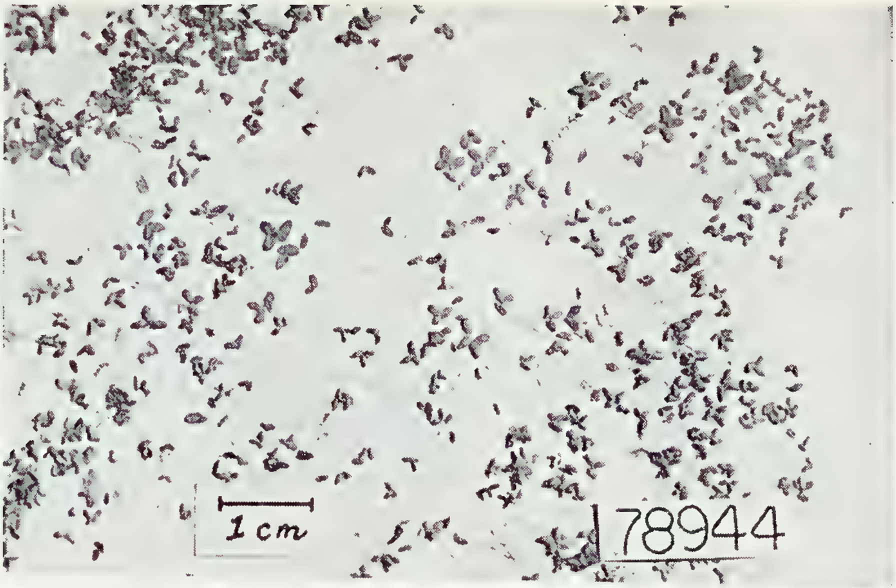


Fig. 1

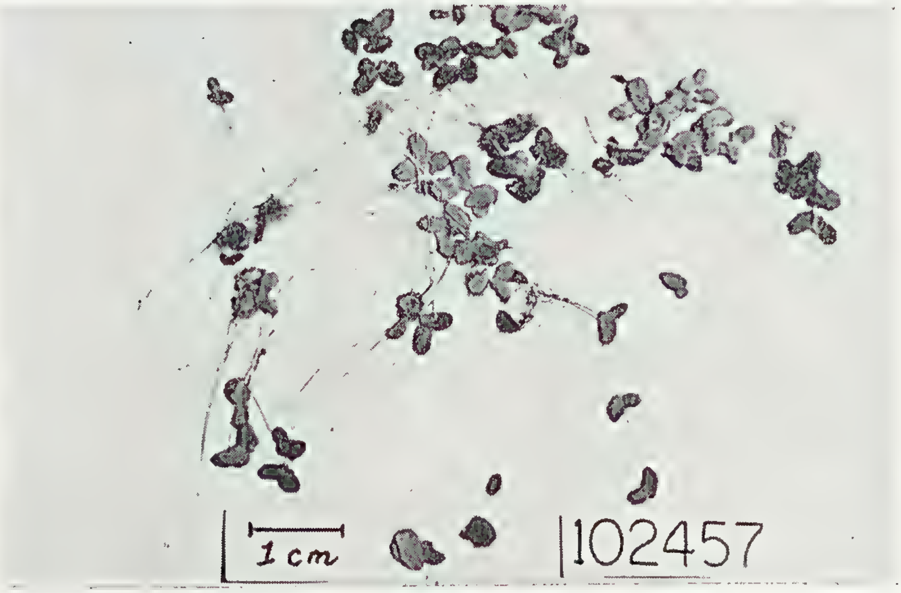


Fig. 2

Fig. 1.—*Spirodela pusilla*, herbarium specimen (NSW 78944), × 1. Fig. 2.—*S. oligorrhiza* var. *oligorrhiza*, herbarium specimen (NSW 102457), × 1.

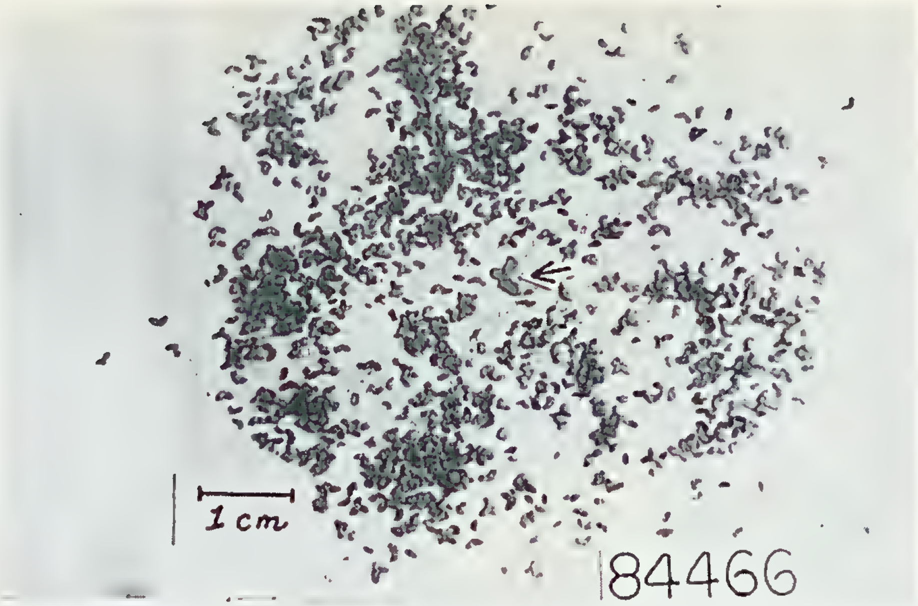


Fig. 1

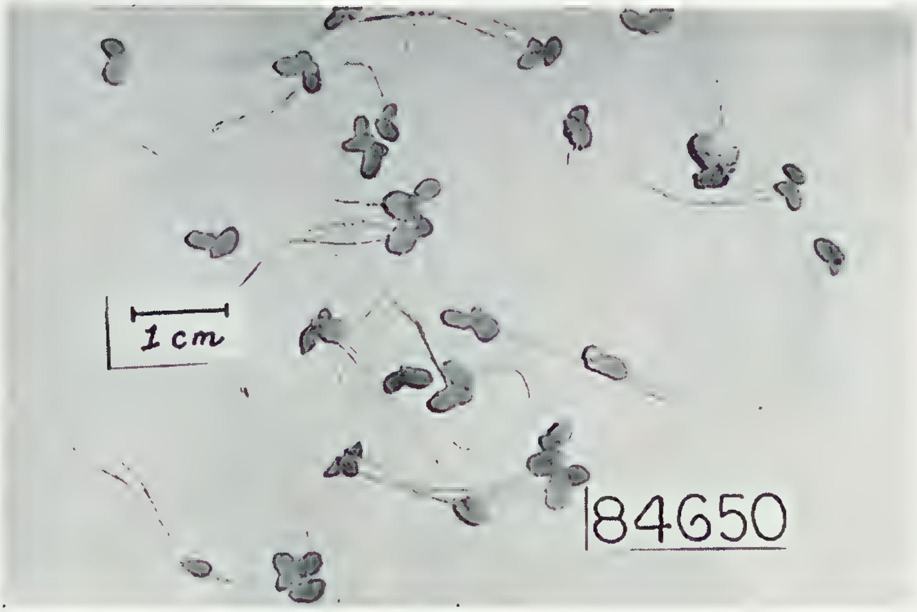


Fig. 2

Fig. 1.—Mixed community of *Spirodela* spp. *S. pusilla* dominant. *S. oligorrhiza* var. *pleiorrhiza* indicated by arrow. Herbarium specimen from Deniliquin (NSW 84466), × 1. Fig. 2.—*S. oligorrhiza* var. *pleiorrhiza*. Herbarium specimen (NSW 84650) cultured from (NSW 84466), × 1.

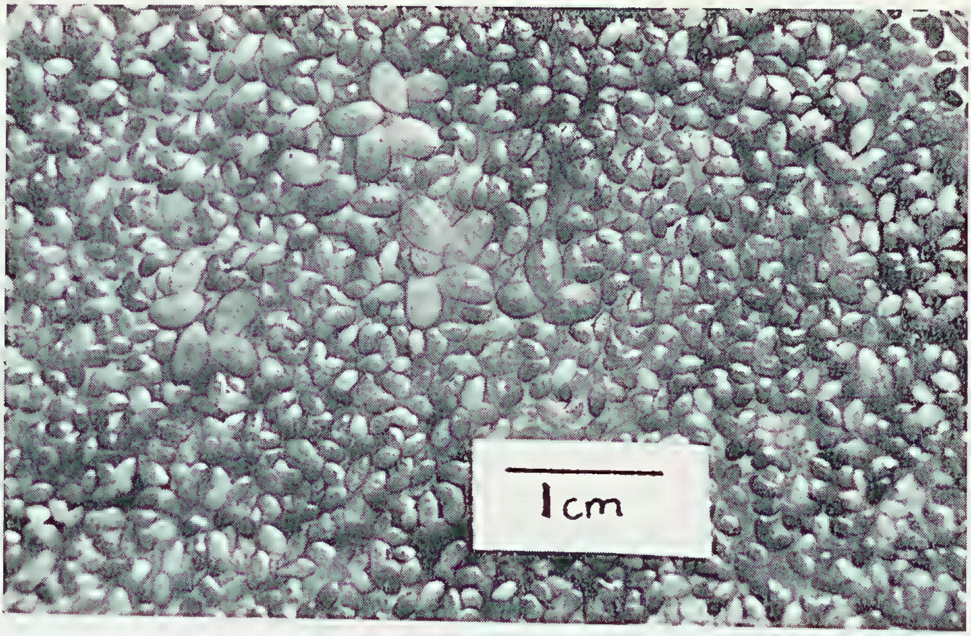


Fig. 1

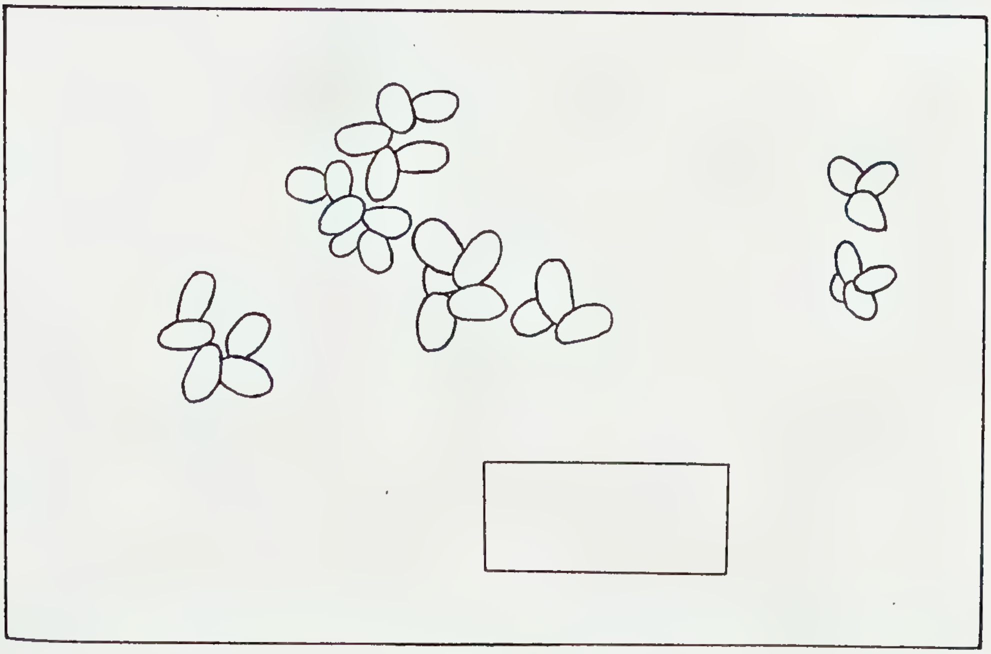
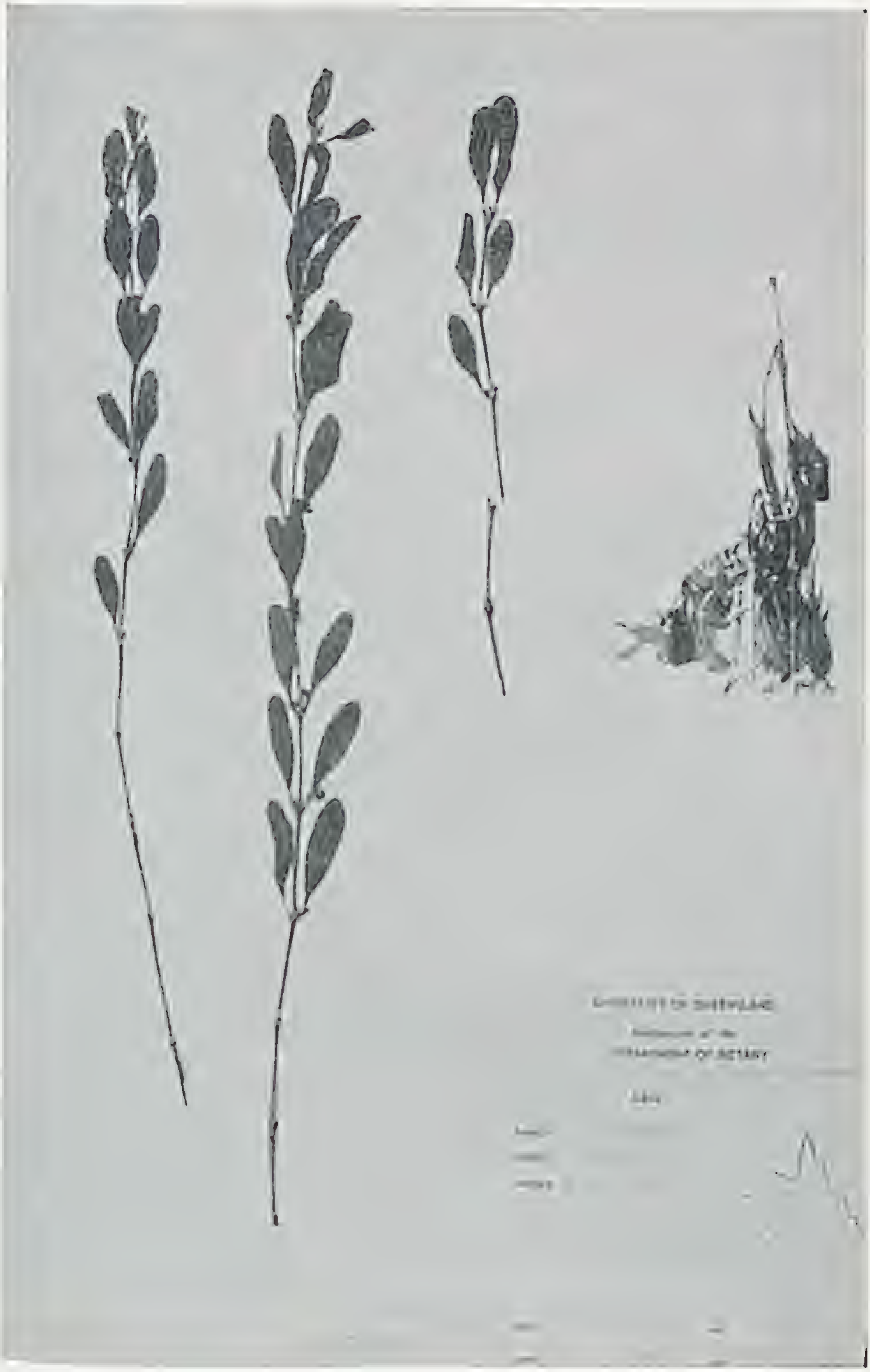


Fig. 2

Relative frond size in *Spirodela pusilla* and *S. oligorrhiza* var. *pleiorrhiza*. Mixed community in culture after growing together for 2 years. *S. pusilla* still dominant. Fig. 1.—photograph by B. G. Briggs, ca. × 2. Fig. 2.—Diagram indicating position of *S. oligorrhiza* var. *pleiorrhiza*, ca. × 2.

Plate IV



Isotype of *Viscum flexicaule.*

Viscum flexicaule, a New Species from Northern Australia

*B. A. BARLOW

SUMMARY

A new species of Viscaceae, *Viscum flexicaule*, is described from near Darwin, Northern Territory. Its relations with *V. whitei* are discussed.

Viscum flexicaule *B.A. Barlow*, **sp. nov.**

HOLOTYPE: Berrimah (near Darwin), *Northern Territory*, parasitic on *Amyema sanguineum* (the latter on *Eucalyptus* sp.), B. A. Barlow No. 514, 1.1963, located at the Herbarium of the Animal Industry and Agriculture Branch, Northern Territory Administration, Alice Springs (NT.)

ISOTYPES: AD; BRI; CANB; NSW.

V. whitei Blakely affinis, sed differt: foliis majoribus spathulatis tenuibus apice rotundato, ramulis gracilioribus, bracteis brevioribus, fructibus pallidis.

Frutex monoicus, glaber, pendulus; stolones nulli. *Rami* graciles, laxe ramosi; internodia primum alterna compressissima, deinde teretia vel angulata, 2–3·5 cm longa. *Folia* tenuia, spathulata, 3–4 cm longa, 0·6–0·9 cm lata, apice rotundato, basi sensim in petiolum 5–7 mm longum attenuata, costa prominenti. Inflorescentiae pedunculatae, cymosae, 3- vel 5-florae, in axillis foliorum singulae vel seriatim ortae; pedunculus teres vel compressus, 2–5 mm longus vel sub fructu longior; bracteae 2, acutae, 0·7 mm longae, ad apicem pedunculi in involucro cymbiformi connatae. *Flos* masculinus in cyma media pedicellatus, globularis, 2-merus, 2 mm diam. *Flores* foeminei laterales, sessiles, cylindracei, 2- vel 3-meri, 2 mm longi. *Fructus* globularis, pallidus, 5 mm diam., apice stylo umbonato persistenti coronatus. Pl. IV.

SPECIMEN EXAMINED: Type collection only.

This species appears not to have been collected previously. By virtue of its small, simple cymose inflorescences with the male flower central, it is close to *V. bancroftii* Blakely and *V. whitei* Blakely of Queensland (cf. Danser, Blumea IV (1941) 266). The latter two species seem to differ only in that *V. bancroftii* is leafless, which is a condition of frequent recurrence in *Viscum* and perhaps with a simple genetic basis. *V. flexicaule* differs from *V. whitei* in having shorter bracteal cups, pale-coloured fruits, larger thinner leaves which are broadly spathulate and rounded at the apex without a mucro and inflorescences which are less frequently entirely female. The two species are also at different ploid levels, *V. flexicaule* having $n = 10$ and *V. whitei* $n = 20$ (Barlow, Proc. Linn. Soc. N.S.W. LXXXVIII (1963) 155, where *V. flexicaule* is listed as *V.* sp.). The chromosomes of *V. flexicaule* are as large as any others in the plant kingdom.

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Taxonomic Notes on *Platylobium*, *Bossiaea*, and *Templetonia* in New South Wales

ALMA T. LEE

SUMMARY

Two new combinations in subspecific rank are published: *Platylobium formosum* ssp. *parviflorum* (BASIONYM *P. parviflorum*), and *Bossiaea rhombifolia* ssp. *concolor* (BASIONYM *B. rhombifolia* var. *concolor*). A species is added to those recorded for New South Wales: *Bossiaea bracteosa*. The name of a common species of *Bossiaea* is changed according to the International Code of Botanical Nomenclature from *B. microphylla* to *B. obcordata*. Information about the typification of the species of *Platylobium*, *Bossiaea* and *Templetonia* from New South Wales is recorded.

ACKNOWLEDGEMENTS

In this work assistance from The Herbarium of the Royal Botanic Gardens Kew (K), the British Museum of Natural History (BM), the Conservatoire et Jardin Botaniques, Geneva (G), and the National Herbarium of Victoria, Melbourne (MEL), was sought. The Directors of these institutions and their staff members are sincerely thanked for the facilities and information provided. Detailed work at The Herbarium, Kew, and the British Museum of Natural History by two Australian Botanical Liaison Officers (Messrs A.B. Court and A.S. George) has been most effective and is also gratefully acknowledged.

INTRODUCTION

These notes are published to validate new combinations prior to their use in the Flora of New South Wales which is currently being prepared, to record the occurrence of a species not previously known from this State, and to discuss the typification of species in *Platylobium*, *Bossiaea* and *Templetonia*. In compiling the section of the Flora of New South Wales pertaining to these genera, an effort was made to check the application of all names used, by reference to their type specimens. In nearly every case it was possible to arrive at a conclusive concept of the specific identity, and these findings are recorded here partly to justify the application of names used in the Flora, and partly to obviate the need for such an investigation in the future. The work was, however, directly related to the needs of the Flora and is not a completely comprehensive investigation. Thus, when a number of syntypes showed reasonable uniformity and represented a synonym of the legitimate name of a species, it was not considered necessary to designate a Lectotype from among them. Similarly, names previously accepted only as synonyms of legitimate names have been assumed to be synonymous when their Types were not readily located for checking and there was no evidence against this assumption. Occasionally details in the original descriptions of these synonyms have cast doubt on the synonymy, and attention is drawn to these cases.

NEW COMBINATIONS

Platylobium formosum *Sm.* ssp. **parviflorum** (*Sm.*) **comb. et stat. nov.**

BASIONYM: *P. parviflorum* Sm., Specimen Bot. Nov. Holl. (1793) 18.

ABSOLUTE SYNONYM: *P. formosum* Sm. var. *parviflorum* (Sm.) Benth., Fl. Austral. II (1864) 154.

According to Domin in Bibl. Bot. XXII Heft 89^2 (1925) 728, De Candolle, Prodr. II (1825) 116, erroneously referred the present subspecies to *P. ovatum* Andr., but I have not seen the specimen cited.

Neither the Holotype of the species nor that of the Basionym of the subspecies *parviflorum* has been seen. However, the illustration with the original description of *P. formosum*, and the description of the Basionym of the subspecies, leave no doubt as to their identity.

Subspecific status is considered appropriate for this population, because of the correlation of geographical distribution with morphological characters distinguishing it from the Type population, ssp. *formosum*. Intergrades between the subspecies are not infrequent in the Central Coast of New South Wales.

Bossiaea rhombifolia *Sieber ex DC.* ssp. **concolor** (*Maid. et Betche*) **comb. et stat. nov.**

Basionym: *B. rhombifolia* Sieber ex DC. var. *concolor* Maid. et Betche in Proc. Linn. Soc. N.S.W. XXXIII (1908) 307.

This subspecific population is referred to without a name by Mueller in Fragm. IX (1875) 45, and by F.M. Bailey, Qld. Fl. (1900) 365.

Holotype examined: *New South Wales:* (as published) Araluen, J. L. Boorman 8.1907 (NSW 43872), but see note on typification below.

Correlation of distribution with morphological differences again makes subspecific status appropriate for this taxon. Although true intergrades have not been encountered, distinction of this subspecies from the Type rests ultimately on very slight differences in leaf shape and flower size and does not justify specific status.

A NEW RECORD FOR NEW SOUTH WALES

Bossiaea bracteosa *F. Muell. ex Benth.*

Since their collection in 1908 and 1911, two of Cambage's specimens, respectively from near Braidwood (NSW 44157) and from the Murrumbidgee-Cotter River junction in the present Australian Capital Territory (NSW 44156) have been placed under incorrect names, until referred to *B. bracteosa* by Mrs J. Thompson about 1958. Distinctions between some of these leafless species of *Bossiaea* were not at that time clear, but reference to Types of the related species (see below) has confirmed Thompson's determination. A good stand of this apparently rare species has recently been found by Mr E.F. Constable near Abercrombie Caves.

NAME CHANGE: *BOSSIAEA OBCORDATA* FOR *B. MICROPHYLLA*

Bossiaea obcordata (*Vent.*) *Druce* in Rep. Bot. Soc. Exch. Club, Suppl. 2, 1916 (1917) 610.

Basionym: *Platylobium obcordatum* Vent., Jard. Malm. (1804) sub n. 31.

Equivalent Synonyms: *Platylobium microphyllum* Sims in Bot. Mag. XXII (1805) t. 863; *Bossiaea microphylla* (Sims) Sm. in Trans. Linn. Soc. IX (1808) 303, based on the preceding.

This common species of eastern New South Wales and of Victoria has always been known in Australian botanical literature as *Bossiaea microphylla*. Although Druce drew attention to the earlier, synonymous *Platylobium obcordatum*, his combination in *Bossiaea* has not come into general use, perhaps because of the obscure publication and inconclusive description of its Basionym. The Type has now been consulted (see *B. obcordata* below) and confirmed as conspecific with *B. microphylla*; thus the name *B. obcordata* must be used for this species.

TYPIFICATION IN THE NEW SOUTH WALES SPECIES OF *PLATYLOBIUM, BOSSIAEA AND TEMPLETONIA*

PLATYLOBIUM

P. formosum *Sm.* A type specimen has not been examined but the original description and accompanying plate show clearly the diagnostic characters (leaflet shape and pubescence of ovary) and make the identity of Smith's specimen quite clear. Although described as "cordato-ovate", the leaves illustrated are scarcely indented and thus approach some of the intermediate forms common in the Central Coast of New South Wales. The ovary of the Type however, shows no intergradant characters, being described as 'germine piloso' and illustrated with hairs on the sides as well as along the suture.

ssp. **parviflorum** (*Sm.*) *Lee* (see above, p. 96). Basionym: *P. parviflorum* Sm. Type not seen but the diagnostic characters are again clearly stated in the original description, thus identifying Smith's plant unequivocally.

var. ***parviflorum*** (Sm.) Benth., absolute synonym of *P. parviflorum* and thus of *P. formosum* ssp. *parviflorum*, q.v.

P. parviflorum Sm., Basionym of *P. formosum* ssp. *parviflorum*, q.v.

P. lanceolatum Andr., Basionym of *Bossiaea lanceolata*, q.v.

P. ovatum Andr., Basionym of *Bossiaea ovata*, q.v.

P. scolopendrum Andr., Basionym of *Bossiaea scolopendria*, q.v.

BOSSIAEA

B. aculeata F. Muell., Basionym of *Templetonia aculeata*, q.v.

B. bracteosa *F. Muell. ex Benth.* Lectotype, here designated: *Victoria:* Mitta Mitta River, F. Mueller (MEL 20333); Lectoparatypes: *Victoria:* (i) Mitta Mitta River, F. Mueller (MEL 20336); (ii–v) Macalister River, F. Mueller (MEL 20330, 20331, 20332 and 20334); (vi) Mt Latrobe (now Mt Loch), F. Mueller (MEL 20335). Some Isotypes should be at The Herbarium, Kew. Two specimens, NSW 44156 (Cambage 2990) and NSW 44157 (Cambage 2074), were compared and showed essential agreement with the Types (A. Lee at MEL, 8.1966). The Lectoparatypes from Macalister River and Mt Latrobe are probably old branches from well grown plants, which reach a height of about 2·5 m, the older branches by that time losing their cladode wings and becoming more or less terete, and up to 3 cm in diameter. Mr J.H. Willis kindly provided information about Mueller's collections and the identity of Mt Latrobe.

B. buxifolia *A. Cunn.* Holotype (K): *New South Wales:* Rocky, brushy hills in the Blue Mountains, A. Cunningham. A duplicate of NSW 26193 (Tuross River, near Belowra, Constable 9.1953), was compared with the Holotype by Mr A. B. Court (report from Kew, 9.8.1967) who found that no differences between them "are evident except very slight differences in pubescence". This report included a detailed description of the Holotype with which our other specimens at the National Herbarium of New South Wales, including those from the Blue Mountains, are in agreement.

B. cinerea *R. Br.* Holotype (BM) presumed to be a sheet bearing three labels as follows: i. Bennett's label numbered 5065; ii. "*Platylobium* Port Dalrymple (*Tasmania*). In ericetis campisque sterilibus Jan: 1–18 1804" in Brown's hand; iii. "*Bossiaea cinerea* R. Br." in Bentham's hand. The following specimens were compared with the three specimens on this sheet:— Disaster Bay near Bay Cliffs, N.S.W., Constable 10.1954 (NSW 30236); and Rocky Cape, Tas., Gunn $\frac{474}{1842}$ 4.10.1838 (NSW 43684). While agreement is not absolute in these three specimens, there can be little doubt from the considerable detail supplied (report A.B. Court, 9.8.1967) that the population from New South Wales known as *B. cinerea* can be properly included in that species without distinction.

B. coccinea Bonpl., an equivalent synonym of *B. cinerea* R. Br. The original description and its accompanying illustration are sufficient to identify the Type, presumably a cultivated plant in the Malmaison garden. Although the leaves of *B. coccinea* were originally described as alternate, this is the condition in a minority of specimens of *B. cinerea* which is sometimes irregular in its leaf insertion but usually has opposite or whorled leaves.

B. cordifolia Sweet, an equivalent synonym of *B. cinerea* R. Br. The application of this name has been deduced from the original description and illustration. The Type was a cultivated plant in an English nursery.

B. decumbens F. Muell., an equivalent synonym of *B. buxifolia* A. Cunn. Syntypes examined (A. Lee at MEL, 8.1966): *Victoria:* (i) Mt Macedon, Dallachy (MEL 18885); (ii) Mt Macedon (without collector's name), (MEL 18886); (iii) Delatite River, F. Mueller 3.1853 (MEL 18887); (iv) ditto, 18.3.1853 (MEL 18888) and (v) ditto, without date (MEL 18889). The Mt Macedon specimens both bear the letter "B" which indicates that Bentham saw them. Several specimens including NSW 43626 and 43631 compared with the Syntypes, are annotated in the National Herbarium of New South Wales, as follows:— "a fair match for the Mt Macedon Syntypes (MEL 18885 and 18886)". They are all conspecific with NSW 26193 (see *B. buxifolia*).

Since there is no significant variation in *B. buxifolia,* a Lectotype for this synonym is not designated.

B. distichoclada F. Muell., an equivalent synonym of *B. foliosa* A. Cunn. There are eight sheets of Syntype material at the National Herbarium of Victoria (examined, A. Lee at MEL 8.1966) viz. *Victoria:* (i) Upper Avon, Gippsland, Mueller (MEL 20320); (ii) Bogong Mts 4–5,000 ft, Mueller (MEL 20321); (iii) Snowy Mts, Mueller (MEL 20322, inscribed "*B. foliosa* A. Cunn." by Bentham, *fide* MEL); (iv) Mitta Mitta, Mueller (MEL 20323); (v) Great Dividing Ranges, Mitta Mitta Ranges towards Bogong, Cobra (i.e. Cobberas) Mueller, 1.1854 (MEL

20324); (vi) in mountains and on Mt Wellington, Gippsland, Mueller 11.1854 (MEL 20325) and (vii and viii) Mitta Mitta, Mueller (MEL 20326, seen by Bentham, and 20327). Although there is some variation in size, shape, pubescence and scabridity of the leaves and in size of stipules, there is no correlation of these characters into recognisable populations. Thus subdivision of the species is considered unjustified and a Lectotype unnecessary. Several specimens from the National Herbarium of New South Wales were compared with the Syntypes and showed similar variation in the characters mentioned. Thus in NSW 101124 and 44465 the leaves are pubescent below, and in NSW 101126, MEL 20320 and 20322 the leaves are glabrous. All are considered undoubtedly conspecific with NSW 48103 (see *B. foliosa*).

B. egena (F. Muell.) F. Muell., absolute synonym of *Templetonia egena* q.v., and based on *Daviesia egena* F. Muell., the Basionym of that species.

B. ensata *Sieber ex DC.* HOLOTYPE (G): Fl. Novae Holl., Sieber No. 434, 1825. A photograph of this specimen at the National Herbarium of New South Wales shows clearly the longer, more slender pedicel and smaller flowers which distinguish this species from the morphologically similar *B. scolopendria.* In addition, the following specimens were sent to Geneva for comparison with the Holotype:— Torrington, Boorman 10.1911 (NSW 44120); Palm Beach, Morris 9.1927 (NSW 44138); Kogarah, Camfield 10.1900 (NSW 44128); Oatley, Camfield 10.1896 (NSW 44121); Heathcote, Fletcher 9.1887 (NSW 44125) and Conjola, Heron 10.1898 (NSW 44152). Mlle S. Vautier reported about this material (21.4.1967) that "la comparison est correcte", noting that the Holotype bears no fruits, nor any true leaves.

B. foliosa *A. Cunn.* HOLOTYPE (K): *New South Wales:* Brushy forest land near Bathurst, A. Cunningham. The following specimens were compared with the Holotype by A.B. Court (report 9.8.1967) who stated that they agree very well in characters of the stems, pubescence and ovary:— Thredbo River gorge, S of Spencer's Creek, Johnson & Constable 1.1951 (NSW 15743) and Mullions Range State Forest, Constable 10.1959 (NSW 48103). The report includes a detailed description of the leaves and stipules of the Holotype which indicate that the population known as *B. foliosa* in New South Wales, is correctly named.

B. heterophylla *Vent.* The Type of this species, cultivated in a French garden, has not been investigated; the original description with its illustration leaves no doubt as to the identity of the species described.

var. ***stenoclada*** Domin. HOLOTYPE not seen: *New South Wales:* near Leura in the Blue Mountains, Domin 4.1910; the distinguishing character, leaf shape, as described in the protologue, is that of one extreme of the continuous variation shown by the species and, since individual plants also show wide variation, is not considered to merit taxonomic distinction. It is therefore included as an equivalent synonym in *B. heterophylla.*

B. humilis Meisn. HOLOTYPE not seen: *New South Wales:* about Sydney, Anderson n. 78 in herb. Shuttleworth. This name has been cited in the literature as a synonym for *B. prostrata,* but its description does not agree closely with characters of that species in that (1) its stipules are longer than the very short petiole, (2) its leaves are 4–5 mm long and (3) its pedicels are shorter than the leaf by half. Characters (1) and (2) would indicate *B. buxifolia* or the variant population in *B.*

prostrata (see below) but (3) is rare in both these species. All three characters indicate *B. neoanglica* but the described leaf shape "not emarginate at the base" is not applicable to that species. The exact identity of *B. humilis* therefore remains unconfirmed.

B. kiamensis *Benth.* HOLOTYPE (K): *New South Wales:* near Kiama, Illawarra, Backhouse. The following specimens were compared with the Holotype at The Herbarium, Kew, by A.B. Court, who reported (9.8.1967) as follows:— "there are no significant differences between the Type of this name and NSW 30980 or 36717 so far as stems, stipules, leaves and calyces are concerned. I have therefore, no hesitation in referring both your specimens to *B. kiamensis*":— Jamberoo-Carrington Falls road, Constable 1.1955 (NSW 30980) and Penrose, Constable 1.1956 (NSW 36717).

B. lanceolata (Andr.) Sims, an equivalent synonym of *B. heterophylla.* BASIONYM: *Platylobium lanceolatum* Andr. The Type of this name, a cultivated plant in an English nursery, has not been seen, but the original description and its accompanying illustration make its identity clear, so that recourse to the Type was not considered necessary.

B. lenticularis *Sieber ex DC.* HOLOTYPE (G-DC): Fl. Novae Holl., Sieber No. 425, 1825. The following specimens were sent to Geneva where they were considered conspecific with the Holotype (report S. Vautier, 21.4.1967):— Grassy Hill, Constable 9.1948 (NSW 27302); Colo Heights, Boyd 11.1964 (NSW 100994); Bell, Blakely 10.1921 (NSW 43801) and South Maroota, Tindale 10.1960 (NSW 52275). A photograph of the Holotype at the National Herbarium of New South Wales supports this.

B. linnaeoides G. Don. Tentatively accepted as an equivalent synonym of *B. prostrata* from the literature, since there is little in the brief description to contradict this and a Type was not readily located.

B. microphylla (Sims) Sm., an equivalent synonym of *B. obcordata.* BASIONYM: *Platylobium microphyllum* Sims. HOLOTYPE: a cultivated specimen from a private garden in England, not seen. The original description and its accompanying illustration make the application of this name quite clear. The synonymy is confirmed by the fact that the specimens compared and agreeing with the Type of *B. obcordata* q.v. are quite characteristic of the population previously known as *B. microphylla.*

B. neoanglica *F. Muell.* HOLOTYPE examined (A. Lee at MEL, 8.1966): *New South Wales:* head of the Macleay River, C. Moore No. 131 (MEL 18890): probable ISOTYPE, without collector's name: New England, ?C. Moore (NSW 43644); this specimen was found at the National Herbarium of New South Wales in a very old collection not incorporated until 1967. As well as the Isotype, other specimens were compared and considered conspecific with the Holotype, and are now so annotated in the latter herbarium:— NSW 43638, 43651 and 93616.

B. nummularia Endl. This name has been accepted as a synonym of *B. prostrata* from the literature; in this case (cf. *B. humilis* and *B. linnaeoides*), the description is sufficiently detailed to suggest that the name was originally applied to a member of the variant population in *B. prostrata* which shows some characters of *B. buxifolia.* The Type was a cultivated plant "in horto Hügeliano".

B. obcordata (*Vent.*) *Druce*. Holotype (G): *Platylobium obcordatum* Nouv. Holl. Sud ouest, Ventenat. The following specimens were compared with the Holotype and considered to be conspecific (report by S. Vautier, 27.11.1967):—near Kuringai, Morris 9.1924 (NSW 43983) and Epping, Ford 9.1947 (NSW 4425). A photograph received at the National Herbarium of New South Wales supports this. The Holotype has spinescent branches, although this is not mentioned in its description. The discrepancy in locality is unexplained, as this species does not occur in Western Australia, nor do I know any other species with which it might be confused.

B. ovata (Andr.) Sm., an equivalent synonym of *B. heterophylla*, Basionym: *Platylobium ovatum* Andr. In his publication (Trans. Linn. Soc. IX (1808) 303) Smith attributed the combination *Bossiaea ovata* to Dryander, but the latter is considered not to have published the combination, since he did not write it down unequivocally but used a conventional method for showing that it should be made (p.c. Mr A.A. Bullock, 11.7.1967). The Type of this name has not been seen, but the original description and its accompanying illustration leave little doubt as to the nature of the Type specimen, which was a cultivated plant in an English nursery. Although Smith's combination *B. ovata* is nomenclaturally based on *Platylobium ovatum* Andr., there remains some doubt that the "wild specimen" mentioned by him really belonged to that species since Index Kewensis refers *B. ovata* Sm. to *B. prostrata*, a species quite distinct from *B. heterophylla.*

B. prostrata *R. Br.* The predominant form of this species in the collections at the National Herbarium of New South Wales occurs throughout the specific range, and is in agreement with the brief original description and its rather ambiguous illustration. There is also another form, which appears to be a minor variant showing some characters of *B. buxifolia*, but it is more localised in distribution and perhaps locally dominant in the western outskirts of Sydney.

Robert Brown left specimens of *B. prostrata* from two localities, Port Phillip and Port Jackson, and these are at present represented at the British Museum of Natural History by four sheets, one from Port Phillip, and three from Port Jackson comprising a main collection and two sheets of duplicate material. Unfortunately the main collection is mixed, one specimen being of the predominant form and the other three of the variant mentioned above. Consequently the better duplicate sheet has been selected as Lectotype. The specimens may be identified as follows:—Lectotype (BM): *New South Wales:* Port Jackson (written on the back of a blue 'Ex herbario Musei Brittanici' label), collected R. Brown. Although Brown's name does not appear anywhere on this sheet, unless written subsequently to my enquiries, the five specimens on it were part of a collection of Brown's duplicates held at the British Museum of Natural History. They are all of the predominant form though somewhat imperfect. Lectoparatypes (BM): (i) Port Jackson, R. Brown, a sheet with four specimens, one of the predominant form and three of the variant; the blue R. Brown label is numbered 5067 indicating that 'duplicates' were distributed by Bennett with this number, and there are three other labels: "*Platylobium** *decumbens* Port Jackson 1903", "*Platylobium procumbens* Port Jackson" and "*Bossiaea prostrata* R. Br."; (ii) Port Jackson, R. Brown, a sheet with two specimens, both of the predominant form; the blue R. Brown label is unnumbered and stuck to it is an old label "*Bossiaea pumilio* Port Jackson". The Port Phillip material, being sterile, is unsuitable as a type. Its labels include Brown's handwritten "*Platylobium procumbens* Port Phillip". The illustration with the description was taken from a cultivated plant, but no appropriate specimen was found in a search for such material. Information in this paragraph was received in reports from A.B. Court who made a detailed examination of the specimens, (9.8.1967 and 3.10.1967) and N.K. Robson (5.6.1968).

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* Altered from *procumbens.*

B. rhombifolia *Sieber ex DC.* HOLOTYPE (G): "Fl. Novae Holl., Sieber No. 354". The following specimens were sent for comparison with the Type to Geneva where S. Vautier reported (21.4.1967) "la comparison est correcte":—Helensburgh, Forsyth 9.1897 (NSW 43834); Timor Rock, Coonabarabran, Boorman 9.1908 (NSW 43859) and Raymond Terrace-Salt Ash, Story No. 6543, 8.1959 (NSW 51096). A photograph of the Holotype at the National Herbarium of New South Wales supports this.

ssp. **concolor** *A. Lee* (see above p. 97). BASIONYM: *B. rhombifolia* var. *concolor* Maid. et Betche. HOLOTYPE examined: *New South Wales:* Narrabri (not Araluen, as published), Boorman 8.1907 (NSW 43872). Boorman's field notes on this sheet, cited verbatim in the original publication of var. *concolor*, identify it as the Type in spite of the discrepancy in locality. The possibility that Araluen was a property name in the vicinity of Narrabri at the time has been investigated, but no such property has been traced, unless one near Coolatai could conceivably be interpreted as "Narrabri". Since the species is not known as far south as Araluen, and this subspecies not south of Mudgee, the locality published must be regarded as an error.

var. ***concolor*** Maid. et Betche. BASIONYM of the preceding, q.v.

B. riparia *A. Cunn. ex Benth.* Mr A.S. George examined the Syntype material of this species at The Herbarium, Kew, on my behalf. As Bentham noted in Flora Australiensis, Cunningham's material is imperfect, but fragments were found which show the diagnostic characters distinguishing it from the morphologically similar *B. ensata* and *B. bracteosa.* Thus, fragments caught in a cobweb near the base of one specimen appear to belong to that plant. They include parts of a legume which is 5 mm broad, apparently contained four or five seeds, and, if complete, would have been little more than 15 mm long. Other fragments comprise three pedicels, each with one or both bracteoles still attached, these structures being just under 1 mm long and showing "1–1·5 mm of pedicel below the insertion of the bracteoles, and about 2·5 mm above". These details identify the species, and the specimen showing them is hereby designated LECTOTYPE: *New South Wales:* stony banks of rivulets winding through the downs of Minera 5 miles SW. from Lake George '*Bossiaea riparia*' C.v.mss; one of the two specimens on this sheet is labelled No. 59. LECTOPARATYPE: Downs of Minera, upper branches of the Lachlan river, N. S. Wales, April, 59/1824 A. Cunningham (report A.S. George, 30.1.1968). Cunningham's "Downs of Minera" are the plains surrounding Canberra, the derivation of the name being obviously the same as that of Monaro (in Cunningham's Journal the word is variously spelt in a number of places Minera, Mineira and Mineiro), from an aboriginal place-name. It may not be common knowledge that the Lachlan River has its upper branches near Crookwell, and Cunningham's journey led him from here directly on to his "Downs of Minera".

B. rossii F. Muell., an equivalent synonym of *Templetonia sulcata* (Meisn.) Benth. HOLOTYPE examined (A. Lee at MEL, 8.1966): *Victoria:* in planitiebus apricis ad fl. Avoca, 4 Dec. (18)53. Dr M(ueller) (MEL 20342, seen by Bentham). This specimen was compared with the Holotype of *Templetonia sulcata* q.v. and found to be closely similar, as it was to NSW 44624 which was also compared with that Type.

B. rotundifolia DC., an equivalent synonym of *B. rhombifolia* Sieber ex DC. Holotype (G): Nouvelle Hollande, Côte orientale. Mus. de Paris 1821. S. Vautier, while comparing specimens from this Herbarium with the Holotype of *B. rhombifolia*, reported (21.4.1967) that *B. rotundifolia* "has leaves similar in form to those of *B. rhombifolia* but larger (e.g. 10 mm long × 13 mm broad)". This observation and the synonymy are supported by a photograph of the Holotype received at the National Herbarium of New South Wales.

B. scolopendria (*Andr.*) *Sm.* Basionym: *Platylobium scolopendrum* Andr. Holotype not seen, a cultivated plant in an English nursery; the plate accompanying the original description of the Basionym of this species shows clearly its diagnostic characters, i.e. the short, rather stout pedicels with large bracts and bracteoles, the larger flowers and broader cladodes, which distinguish it from the similar *B. ensata*. The change in spelling of the epithet of this name, from the original *scolopendrum* to *scolopendrium* is based on the contention that the former was an orthographical error, since it is incorrect to alter the gender of the noun *scolopendra* (Gk., f., the millipede) to agree with the neuter generic name *Platylobium*. *Andrews perhaps intended his epithet to be adjectival, since he did alter the noun in this way*, and Ventenat was thus correct in changing it to the adjectival form, *P. scolopendrium* in Jard. Malm. n. 55 (1803/4), maintained in *Bossiaea scolopendria* (comment from Mr H.K. Airy Shaw in report from A.S. George 10.8.1968 with my interpolation in italics).

B. scortechinii *F. Muell.* Holotype examined (A. Lee at MEL, 8.1966): *Queensland:* Stanthorpe, Scortechini No. 369 (MEL 18891). Several specimens are now annotated as conspecific in the National Herbarium of New South Wales after comparison with the Holotype:— NSW 43446, 43448, 43451, 43452, 43453, 43456 and 43460. In particular NSW 43453 and 43456 match the Type in length of pedicel (7–9 mm) which is a variable character in this species.

B. stenophylla F. Muell., Basionym of *Templetonia stenophylla* q.v.

B. stephensonii *F. Muell.* Holotype examined (A. Lee at MEL, 8.1966): *New South Wales:* near Wollongong, L. St(ephenson) 10–11.1886 (MEL 20329); several specimens in the National Herbarium of New South Wales are annotated as conspecific after comparison with the Holotype: NSW 43942, 43943, 43950, 43951, 43954 and 43955.

B. tenuicaulis Grah., an equivalent synonym of *B. cinerea* R. Br. The Type, not seen, was a cultivated specimen in Edinburgh Botanic Gardens. Graham's original publication is quoted verbatim and at length by Hooker in Bot. Mag. LXVIII (1842) t. 3895, including data on the source of the figured plant: "This plant was raised at the Botanic Garden, Edinburgh, from Van Diemen's Land seeds, sent by Mr Cooper . . . etc.". It is thus apparent that t. 3895 is a figure of the Type specimen. This illustration makes the identity of *B. tenuicaulis* quite clear and it must be accepted as a synonym of *B. cinerea* as typified above.

B. sulcata Meisn., Basionym of *Templetonia sulcata* q.v.

B. walkeri *F. Muell.* Holotype examined (A. Lee at MEL, 8.1966): *New South Wales:* in pinetis montium Peel Range (now Cocoparra Range) inter flumina Lachlan et Murrumbidgee, Alex Walker (MEL 20337). The following specimens in the National Herbarium of New South Wales were compared with the Holotype and are considered undoubtedly conspecific:— NSW 44193, 44194, 44202, 44203, 44205, 84856, 84857 and 84858.

TEMPLETONIA

T. aculeata (*F. Muell.*) *Benth.* BASIONYM: *Bossiaea aculeata* F. Muell. HOLOTYPE examined: *Western Australia:* twiggy shrub in sand near Cujong, Oldf[ield] 57 (MEL 20339, seen by Bentham). NSW 44600 was compared with the Holotype and considered undoubtedly conspecific (A. Lee at MEL, 8.1966).

T. egena (*F. Muell.*) *Benth.* BASIONYM: *Daviesia egena* F. Muell. Four sheets of Syntype material were examined (A. Lee at MEL, 8.1966): (i) Nov. Holl. austr., Mueller (MEL 20343); (ii and iii) *South Australia:* between Spencer's Gulf and Crystal Brook, Mueller 10.1851 MEL 20344, seen by Bentham, and MEL 20346); (iv) *New South Wales:* Murray scrub towards Morundah, 2.1851 (MEL 20345). These specimens are uniform, so that Lectotype selection is not proposed. NSW 44536, 44540 and 97416 were compared with them and considered undoubtedly conspecific, the last-mentioned being particularly noted in the National Herbarium of New South Wales as a good match for the particular Syntypes, MEL 20344 and 20346.

T. muelleri Benth., an absolute synonym of *T. stenophylla* (F. Muell.) J.M. Black q.v.

T. stenophylla (*F. Muell.*) J.M. Black. BASIONYM: *Bossiaea stenophylla* F. Muell. HOLOTYPE examined: *Victoria:* South western part of Australia Felix at Milton (i.e. Melton, near Bacchus Marsh), Max Weidenbach (MEL 20448, seen by Bentham). NSW 44613 and 44614 were compared with the Holotype and considered undoubtedly conspecific (A. Lee at MEL, 8.1966).

T. sulcata (*Meisn.*) *Benth.* BASIONYM: *Bossiaea sulcata* Meisn. HOLOTYPE (MEL): *Western Australia:* sandy plains of the Avon (*fide* Bentham), Preiss No. 1028 (MEL 20340 and 20341, seen by Bentham). Specimens compared with the Holotype and considered undoubtedly conspecific (A. Lee at MEL, 8.1966) are now annotated in the National Herbarium of New South Wales: NSW 44623–44626.

A Revision of the Species *Isotoma fluviatilis*

* Jennifer A. McComb

SUMMARY

Three subspecies are distinguished in *Isotoma fluviatilis* (R. Br.) F. Muell.; namely ssp. *fluviatilis* which is diploid and dioecious and occurs on the coastal plain near Sydney; ssp. *borealis* ssp. nov. which is diploid and hermaphrodite and occurs on the Eastern Highlands in northern New South Wales and just extends into southern Queensland; and ssp. *australis* ssp. nov. which is tetraploid and hermaphrodite and occurs to the south of the diploids in New South Wales, Victoria, South Australia, and Tasmania.

Wimmer (1953) placed *Laurentia fluviatilis* (R. Br.) E. Wimm. in the Section *Isotoma* of the genus *Laurentia* and described three varieties based on leaf length, peduncle length and presence or absence of hairs on the inner surface of the corolla. However, following observations on anther morphology and pollination mechanism, Melville (1960) placed this species, together with the other nine Australian species, in the genus *Isotoma* Lindl. distinct from the genus *Laurentia* Adans. The material attributable to *I. fluviatilis* (R. Br.) F. Muell. was reduced, when Moore in Allan (1962) showed that New Zealand specimens which Wimmer cited under *L. fluviatilis* var. *fluviatilis* should be referred to *Hypsela rivalis* E. Wimm. McComb (1968) reported the occurrence of diploid hermaphrodite, tetraploid hermaphrodite, diploid dioecious and diploid gynodioecious races of *I. fluviatilis*. The morphology, cytology and geographical distribution of these races show that they do not correspond with the varieties delimited by Wimmer. The genetic basis for unisexuality and the relationship between the various cytological races has also been described (McComb, 1969), and the present paper presents a taxonomic revision of the species. Wimmer (1953) cites *Enchysia baueri* Presl, *E. baueri* var. *major* Presl and *E. gaudichaudii* Presl as synonyms of *I. fluviatilis* but the description and locality (New Holland) given by Presl (1836) are insufficient to determine whether these can be attributed to a particular subspecies. In addition it is most desirable that the two hermaphrodite subspecies be based on type material which has been examined cytologically. The formal description of the species has been extended to include the range of morphology observed among the subspecies.

Isotoma fluviatilis (*R. Br.*) *F. Muell. ex Bentham*, Fl. Austral. IV (1868) 136; F. Muell., Fragm. X (1876–77) 39; F.M. Bail., Synops. Qld. Fl. (1883) 284; F.M. Bail., Qld. Fl. III (1900) 921; Moore & Betche, Handb. Fl. N.S.W. (1893) 302; Black, Fl. S. Austral., ed. 1, 4 (1929) 549; Ewart, Fl. Vict. (1931) 1060; Curtis, Students' Fl. Tas., part 2 (1963) 411.

Laurentia fluviatilis (R. Br.) E. Wimm., Ann. Naturhist. Mus. Wien LVI (1948) 335; E. Wimm., Das Pflanzenreich IV, 276b, 107 (1953) 399; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Dist. (1963) 364.

Lobelia fluviatilis R. Br., Prodr. Fl. Nov. Holl. (1810) 563; Roem. & Schult., Syst. V (1819) 69; G. Don. Gen. Syst. III (1834) 713; DC., Prodr. VII (1839) 366; J. D. Hooker, Fl. Tas. I (1856) 238; F. Muell., Fragm. IV (1863–4) 171.

Lobelia inundata R. Br., Prodr. Fl. Nov. Holl. (1810) 563.

Enchysia lessonii Presl, Prodr. Mon. Lobel. (1836) 40.

Enchysia gaudichaudii Presl, l.c. 41.

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Enchysia baueri Presl var. β *major* Presl, l.c. 40.

Laurentia gaudichaudii (Presl) DC., *L. baueri* (Presl) DC. and *L. baueri* var. *major* (Presl) DC., Prodr. VII (1839) 411.

Rapuntium ?fluviatile (R. Br.) Presl et *R. ?inundatum* (R. Br.) Presl, Prodr. Mon. Lobel. (1836) 30.

Herba glabra vel puberula, prostrata, caulibus radicantibus. Folia sessilia vel breviter petiolata, plerumque elliptica vel obovata superiora angustiora, 5–13 mm longa, 2–7 mm lata, margine serrata vel integra. Flores in axillis foliorum solitarii, hermaphroditi vel unisexuales. Pedicelli 5–60 mm longi. Hypanthium obconicum, glabrum vel interdum hirtum; lobi calycis subulati ad 2 mm longi. Corolla caerulescens vel fere alba, extus persaepe glabra, intus sparse pilosa vel glabra, 4–15 mm longa, subbilabiata; lobi circiter aequales, lineari-lanceolati, patentes, acuti, tubum infundibularem circiter aequantes; tubus integer vel dorso exigue fissus. Filamenta intus pilosa. Antherae fertiles nigrocaesiae, 2 inferiores apice setis duabus et pilis brevibus terminatae, 3 superiores supra plerumque puberulae. Capsula obconico-cylindracea, 4–7 mm longa, 2–3 mm lata, valvis duabus apice loculicide dehiscens, raro subsucculenta et tarde dehiscens. Semina brunnea vel pallide brunnea, lucida foveolata. Chromosomata somatica 14 vel 28.

Glabrous or minutely pubescent herb, prostrate, with stems rooting. Leaves sessile or shortly petiolate, mostly elliptical to obovate, upper ones narrower, 5–13 mm long, 2–7 mm broad, the margin serrate or entire. Flowers solitary in leaf axils, hermaphrodite or unisexual. Pedicels 5–60 mm long. Hypanthium obconical, glabrous or sometimes hairy; calyx-lobes subulate, about 2 mm long. Corolla sky-blue to almost white, exterior almost always glabrous, interior with scattered hairs or glabrous, 4–15 mm long, subbilabiate; lobes almost equal, linear-lanceolate, spreading, acute, about as long as the infundibular tube; tube entire or notched on the upper side. Inner surface of filaments hairy. Fertile anthers blue-black, 2 lower ones with 2 setae and cluster of short hairs at the apex, the upper surface of the three upper anthers usually minutely pubescent. Capsule obconical-cylindrical, 4–7 mm long, 2–3 mm wide, 2 apical valves dehiscing loculicidally, rarely somewhat fleshy and tardily dehiscent. Seeds brown or light brown, shining, finely pitted. Chromosome No. $2n = 14$ or 28.

A polymorphic species forming a low compact mat in exposed positions, but producing larger leaves and pedicels, as well as long scrambling stems in sheltered positions. Flowering specimens have been collected between late September and April. This species may occur as a weed in lawns.

Key to the Subspecies

1. Flowers unisexual, inner surface of corolla glabrous .... ssp. *fluviatilis* a.
1.* Flowers hermaphrodite, inner surface of corolla hairy.
    2. Corolla 6–10 mm long, mean pollen diam.† less than 33·5 μ .... ssp. *borealis* b.
    2.* Corolla 7–15 mm long, mean pollen diam.† greater than 34·5 μ .... ssp. *australis* c.

a. ssp. fluviatilis

Lobelia fluviatilis R. Br., Prodr. Fl. Nov. Holl. (1810) 563.

Lobelia inundata R. Br., l.c.

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† Mean pollen diameter was estimated from measurements of at least 10 grains mounted in 45% acetic acid with orcein. Preparations were heated only in the case of old herbarium specimens.

Isotoma fluviatilis var. *inundata* F. Muell. ex Benth., Fl. Austral. IV (1869) 137.

Rapuntium ?fluviatile (R. Br.) Presl and *R. ?inundatum* (R. Br.) Presl, Prodr. Mon. Lobel. (1836) 30.

‡ *Enchysia lessonii* Presl. l.c. 40.

LECTOTYPE: Banks of Nepean, Junction Island, *New South Wales*, R. Brown (Bennett No. 2618), female (BM). ISOTYPE: (K).

PARATYPE: Port Jackson, *New South Wales*, R. Brown 20.5.1802 (Bennett No. 2619), male (BM).

Folia 5–10 (–15) mm longa, 3–5 (–7) mm lata. Pedicelli 1–15 (–30) mm longi. Hypanthium pilis parvis sparsis vel longis densis instructum. Corolla intus glabra. Dioica. Flores feminei: hypanthium (2–) 4–5 mm longum; corolla 4–6 mm longa (ad 8 mm in tepidario); antherae parvae pallidae sine polline; ovula fertilia. Flores masculini: hypanthium 1–2 mm longum; corolla 3 mm longa in typo plerumque 4–7 mm longa (ad 11 mm in tepidario), antherae nigrocaesiae, polline fertili; stigma e tubo antherarum raro egrediens; ovarium sine ovulis vel raro unum vel duo continens. Chromosomata somatica 14. Pl V, VI et VIIIA.

Leaves 5–10 (–15) mm long 3–5 mm broad. Pedicels 1–15 (–30) mm long. Hypanthium with short sparse hairs or long dense hairs. Corolla glabrous inside. Dioecious. Female flowers: hypanthium (2–) 4–5 mm long; corolla 4–6 mm long (up to 8 mm in the glasshouse); anthers small, pale, without pollen; ovules fertile. Male flowers: hypanthium 1–2 mm long; corolla 3 mm long in the type, usually 4–7 mm long, (up to 11 mm in the glasshouse); anthers blue-black, pollen fertile; stigma rarely exserted from the anther tube; ovary without ovules or rarely with one or two. Chromosome No. $2n = 14$. Pl. V, VI and VIIIA.

DISTRIBUTION: In wet places around dams and creeks on the coastal plain to the north and west of Sydney, up to 2,000 ft but mostly below 1,000 ft. Distribution map, see McComb (1968).

SPECIMENS EXAMINED: Except where stated collections are both female and male plants. NEW SOUTH WALES: Gloucester Buckets, J. Maiden 9.1897 (NSW 90601) male; Gloucester, J. & A. McComb No. 620, 18.12.1966 (NSW 87327); 1½ miles E. of Forbesdale, J. & A. McComb No. 619, 18.12.1966 (NSW 87328); Bulahdelah, H. Rupp 3.1924 (Botany Dept., University of Melbourne—*I. fluviatilis* No. 2) female; Robert's Creek, near Wilberforce, J. & A. McComb No. 605, 13.12.1966 (NSW 87343); 5 miles E of Windsor, J. & A. McComb No. 621, 20.12.1966 (NSW 87323–6); Narrabeen Lake, E. Constable No. 4233, 26.4.1963 (NSW 64389) female; Richmond, Woolls, no date (MEL 16010) male; Yarramundi-Agnes Banks, ca. 2½ miles S of Richmond, E. Constable No. 4669, 8.1.1964 (NSW 70322); Port Jackson, R. Brown 20.5.1802, Bennett No. 2619 (BM) male, (photograph seen); Port Jackson, R. Schomburgk (AD 96718069) female; Gordon (suburb of Sydney), V. Kinsella 9.1944 (NSW 90592) male; Emu Plains, Betche 27.10.1881 (NSW 90581) female; Blaxland Estate, Central Tablelands, J. Fletcher (NSW 90599) male; Parramatta, Woolls (MEL 16020) female, (MEL 16023–5) male; Nepean River, Junction Island, R. Brown, Bennett No. 2618 (BM, K) female (photograph seen); Caddies Brook, near Kellyville, J. & A. McComb No. 603, 13.12.1966 (NSW 87344); South Creek, E of Richmond, J. & A. McComb No. 606, 14.12.1966 (NSW 87342); South Creek, S. James 21.4.1967 (NSW 87348, 87351); Berkshire Park, near Richmond, J. & A. McComb No. 607, 14.12.1966 (NSW 87341); Rivatt's Creek, Springwood to Richmond, J. & A. McComb No. 609, 14.12.1966 (NSW 87339); 5½ miles W of Springwood, J. & A. McComb No. 610, 15.12.1966 (NSW 87338); Cecil Park, Wallacia to Mulgoa, J. & A. McComb No. 608, 14.12.1966 (NSW 87340).

b. **ssp. borealis** *J.A. McComb*, **ssp. nov.**

HOLOTYPE: 6 miles from Ben Bullen to Ilford, *New South Wales*, J. & A. McComb 16.12.1966 (NSW 87335).

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‡ *E. lessonii* Presl is probably a synonym of ssp. *fluviatilis*, as Wimmer (1953) describes the inner surface of the corolla as glabrous in the variety which he based on *E. lessonii*. Presl's specimen is cited by Wimmer but no information about it could be obtained from the Prague Herbarium.

Folia (4–) 5–12 mm longa, 2–5 mm lata. Pedicelli 5–40 (–50) (fructiferi ad 60) mm longi. Flores hermaphroditi: hypanthium glabrum vel puberulum; corolla 6–10 mm longa (ad 13 mm in tepidario); corollae tubus lobique intus pilosi; medium variationis diemetris granulorum pollinis minus quam 33·5 μ; ovula fertilia. Chromosomata somatica 14. Pl. VII et VIIIA.

Leaves (4–) 5–12 mm long, 2–5 mm broad. Pedicels 5–40 (–50) (up to 60 in fruit) mm long. Flowers hermaphrodite; hypanthium glabrous or minutely pubescent; corolla 6–10 mm long (up to 13 mm in glasshouse), corolla tube and lobes hairy inside; average pollen grain diameter less than 33·5 μ; ovules fertile. Chromosome No. $2n = 14$. Pl. VII and VIIIA.

DISTRIBUTION: In wet places including *Sphagnum* bogs in northern New South Wales and southern Queensland; between 1,500–3,100 ft. in the Great Dividing Range. The southern limit is about 15 miles south of Bathurst. Distribution map, see McComb (1968).

SPECIMENS EXAMINED: QUEENSLAND: Applethorpe, S. Everist & L. J. Webb 22.11.1946 (BRI 061783); Ballandean, M. Clemens 10.1944 (BRI 061785). NEW SOUTH WALES: Maryland, E. Hickey 1.1885 (MEL 15981); Torrington, J. Boorman 1.1916 (NSW 90584); Emmaville, F. Kenny 2.1911 (BRI 061787); Copmanhurst, H. Rupp 11.1909 (NSW 90613); Blue Hole, 12 miles E of Armidale, G. Davis 25.2.1943 (NSW 90607); Mudgee, Woolls, no date (MEL 16021); Dilga, F. Stewart 3.1907 (NSW 90598); Currant Mt Gap, E of Olinda, H. McKee No. 462, 11.1.1953 (NSW 90609); 24 miles E of Rylstone, J. & A. McComb Nos 616, 616b, 17.12.1966 (NSW 87331–2); 6 miles N of Ben Bullen, J. & A. McComb No. 613, 16.12.1966 (NSW 87335); 2 miles S of Ben Bullen, J. & A. McComb No. 612, 16.12.1966 (NSW 87336); Bumberry, J. Boorman 11.1906 (NSW 90583); Bowan Park, W. Blakely 11.1907 (NSW 90597); Bathurst, J. Holbeche 9.4.1956 (NSW 90586); 14 miles S of Bathurst, S. James 21.4.1967 (NSW 87349); Medlow, A. Hamilton 1.1903 (NSW 49409); Hazelbrook, R. Cambage 11.1904 (NSW 90589).

One gynodioecious population is known in which female plants have flowers of the above description but the anthers are pale and have no pollen: "Khyber Pass" 16 miles E of Rylstone, New South Wales, J. & A. McComb No. 615, 16.12.1966 (NSW 87358) hermaphrodite, (NSW 87333) female.

Diploid hermaphrodite plants are known from near Randwick Racecourse (Sydney, N.S.W.), E. Betche 11.1891 (NSW 49407), and from the adjacent Centennial Park, E. Cheel, 10.12.1898 (NSW 90596); W. Forsyth 4.1900 (NSW 49406, 49408). The genetic system controlling unisexuality in this species does not preclude the rare occurrence of hermaphrodite plants in an otherwise dioecious population. However the inner surface of the corolla is hairy in the above specimens and they may be introductions of ssp. *borealis*.

c. ssp. australis *J.A. McComb*, ssp. nov.

HOLOTYPE: 40 miles S of Cowra towards Boorowa, *New South Wales*, J. & A. McComb 1.1.1967 (NSW 87297).

Folia 5–13 mm longa, 2–7 mm lata. Pedicelli (3–) 5–60 (–85) mm longi. Flores hermaphroditi: hypanthium plerumque glabrum; corolla 7–12 (–15) mm longa (ad 19 mm in tepidario), caerulescens (raro subrosea), corollae tubus lobique intus pilosi; medium variationis diemetris granulorum pollinis plus quam 34·5 μ. Chromosomata somatica 28. Pl. VIII.

Leaves 5–13 mm long, 2–7 mm broad. Pedicels (3–) 5–60 (–85) mm long. Flowers hermaphrodite; hypanthium mostly glabrous; corolla 7–12 (–15) mm long (up to 19 mm in glasshouse), blue (rarely pinkish), corolla tube and lobes hairy inside; average pollen grain diameter more than 34·5 μ. Chromosome No. $2n = 28$. Pl. VIII.

Cytological examination may be necessary to distinguish this subspecies from ssp. *borealis*.

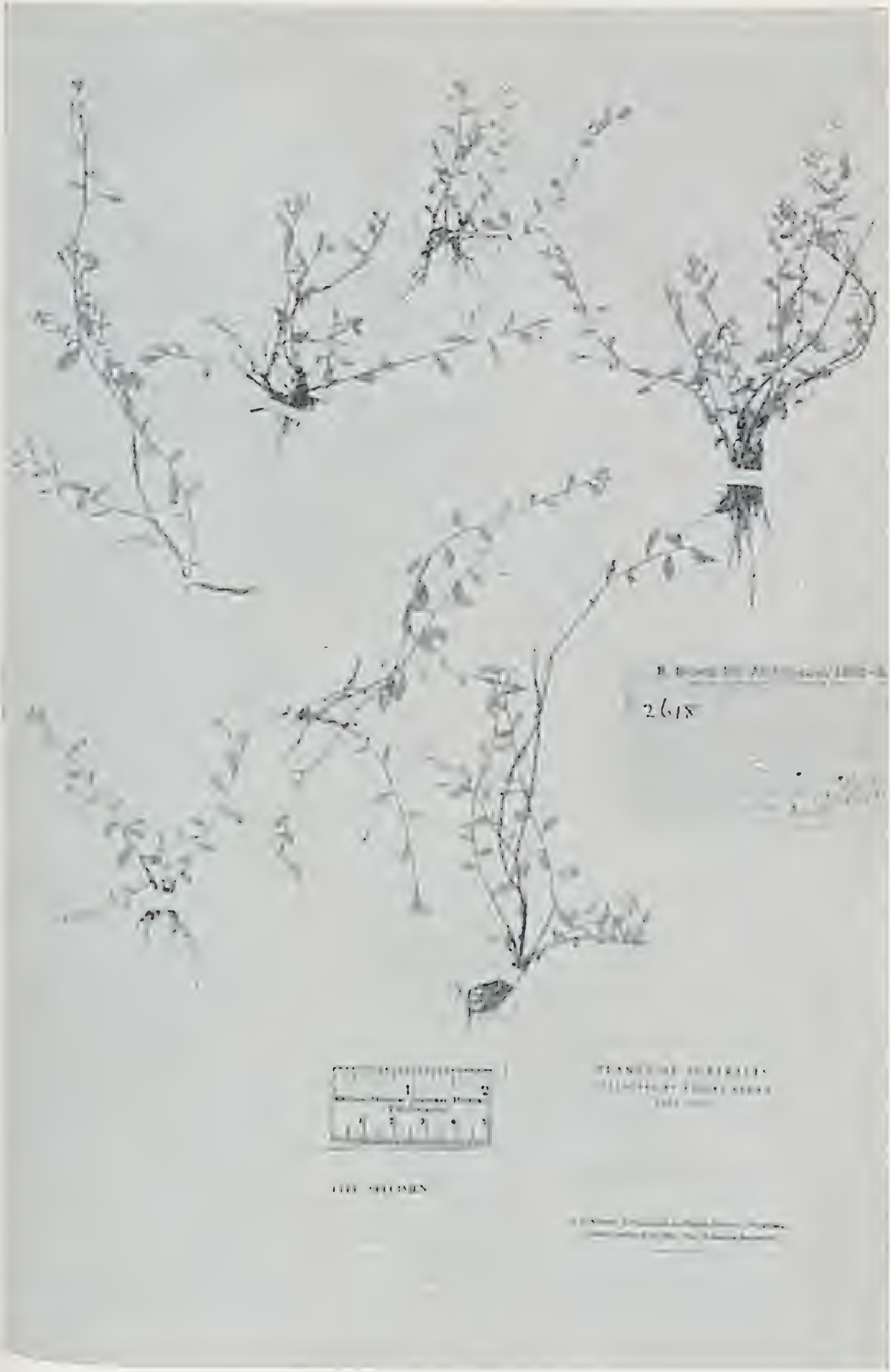
Distribution: The most widespread of the subspecies, occurring to the south of the diploid *borealis* in New South Wales and also in Victoria, South Australia and Tasmania; from coastal localities to 4,200 ft. Distribution map, see McComb (1968).

Specimens Examined: New South Wales: 6 miles W of Mandurama, J. & A. McComb No. 647, 2.1.1967 (NSW 87296); 24 miles S of Bathurst, J. & A. McComb No. 641, 1.1.1967 (NSW 87302); Oberon, J. Vickery, 27.11.1948 (NSW 90591); Oberon, J. & A. McComb No. 639, 1.1.1967 (NSW 87304); 50 miles S of Bathurst, J. & A. McComb No. 642, 1.1.1967 (NSW 87301); 44 miles N of Taralga, J. & A. McComb No. 637, 31.12.1966 (NSW 87306); 3 miles N of Grenfell, H. Salasoo No. 2991, 31.12.1964 (NSW 90577); Jenolan Caves, W. Blakely, no date (NSW 90585); Lower NE slopes of Mt. Tennent, P. Darbyshire 25.10.1961 (NSW 90579); 33 miles N of Taralga, J. & A. McComb No. 636, 31.12.1966 (NSW 87307); 24 miles N of Taralga, J. & A. McComb No. 635, 31.12.1966 (NSW 87308); 13 miles N of Taralga, J. & A. McComb No. 634, 31.12.1966 (NSW 87309); 4 miles N of Taralga, J. & A. McComb No. 633, 31.12.1966 (NSW 87310); 79 miles S of Bathurst, J. & A. McComb No. 643, 1.1.1967 (NSW 87300); 40 miles S of Cowra, J. & A. McComb No. 646, 1.1.1967 (NSW 87297); 96 miles S of Cowra, between Crookwell and Boorowa, J. & A. McComb No. 645, 1.1.1967 (NSW 87298); between Laggan & Crookwell, J. & A. McComb No. 644, 1.1.1967 (NSW 87299); between Yass and Boorowa, C. Moore No. 2809, 30.11.1953 (NSW 90603); 17 miles N of Goulburn, J. & A. McComb No. 632, 31.12.1966 (NSW 87311); 7 miles N of Goulburn, J. & A. McComb No. 631, 31.12.1966 (NSW 87312–4); 7 miles N of Marulan, J. & A. McComb No. 602, 12.12.1966 (NSW 87345); 8 miles S of Marulan, J. & A. McComb No. 601, 12.12.1966 (NSW 87346); Paddy's River, J. & A. McComb No. 648, 3.1.1967 (NSW 87295); 5 miles SW of Goulburn, J. & A. McComb No. 630, 31.12.1966 (NSW 87315); 7 miles from Goulburn, towards Bungonia, C. Moore No. 2741, 20.10.1953 (NSW 90587); 15 miles S of Goulburn, J. & A. McComb No. 629, 31.12.1966 (NSW 87316); 7 miles N of Yass River, J. & A. McComb No. 628, 31.12.1966 (NSW 87317); 2 miles S of Yass River, J. & A. McComb No. 627, 31.12.1966 (NSW 87318); Queanbeyan, R. Cambage No. 3258, 13.12.1911 (NSW 90612); Queanbeyan, R. Cambage No. 3260, 14.12.1911 (NSW 90604); Black Mountain, H. McKee No. 9929, 5.11.1960 (NSW 90578); Tidbinbilla District, Hj. Eichler 18.12.1956 (AD 95915027); Wagga, no collector (NSW 90582); 13 miles E of Braidwood, J. & A. McComb No. 624, 21.12.1966 (NSW 87321); 26 miles E of Braidwood, J. & A. McComb No. 623, 21.12.1966 (NSW 87322); 6 miles W of Braidwood, J. & A. McComb 21.12.1966 (NSW 87320); Koetong, J. & A. McComb No. 626, 29.12.1966 (NSW 87319); Badja, A. Costin 1.1950 (NSW 90600); Countegany, Tuross River District, T. Whaite No. 421, 21.12.1949 (NSW 90580); Gerogery, E. McBarron No. 4259, 14.12.1949 (NSW 49410); N of Albury, F. Rodway 25.11.1933 (NSW 90611); Albury, Patterson 12.1916 (NSW 49411). Victoria: Upper Murray, Findlay 1883 (MEL 15978); Hume River, F. von Mueller 1.1879 (MEL 15997); Myrtleford, Lucas 11.1883 (MEL 15982); Upper Yarra, C. Walter 1889 (NSW 90588), (BRI 061781); Puckapunyal, C. Davis 11.1942 (NSW 90610); Mt Macedon, 12.1883 (MEL 15985–87); Oakleigh, Melbourne, F. Reader 6.3.1886 (MEL 15992); Melbourne and Brighton, F. von Mueller Herb. 11.1852 (MEL 16005); Castlemaine, no collector 12.1852 (MEL 16009); Colac, F. von Mueller Herb. 3.1874 (MEL 15994); Mt William, D. Sullivan 11.1871 (MEL 15991, 16001); Hawkesdale, H. Williamson 11.1900 (NSW 90590); Hopkins River, C. Wilhelmi 12.1856 (MEL 15980); between Warrnambool and Nullawarre, D. Whibley 20.10.1957 (AD 95750008); Port Fairy, W. Whan, no date (NSW 90594); Portland, W. Allit, no date (MEL 15993); Glenelg River, C. Walter, no date (MEL 16000). South Australia: Naracoorte Caves, D. Hunt 29.11.1964 (AD 96501079); Kalangadoo, J. Cleland 7.12.1922 (AD 96718000); Monbulk, H. Andrew 5.12.1918 (AD 96718000); Myponga, J. Cleland 2.12.1923 (AD 96718001), 10.11.1906 (AD 96718000). Tasmania: Quamby Brook, F. Kenny 1909 (BRI 061786); St. Pauls River (MEL 16018); Deloraine, no collector 1.1949 (MEL 16011); Lake St. Clair, Hj. Eichler 15.1.1960 (AD 96106086 and 96106153).

ACKNOWLEDGEMENTS

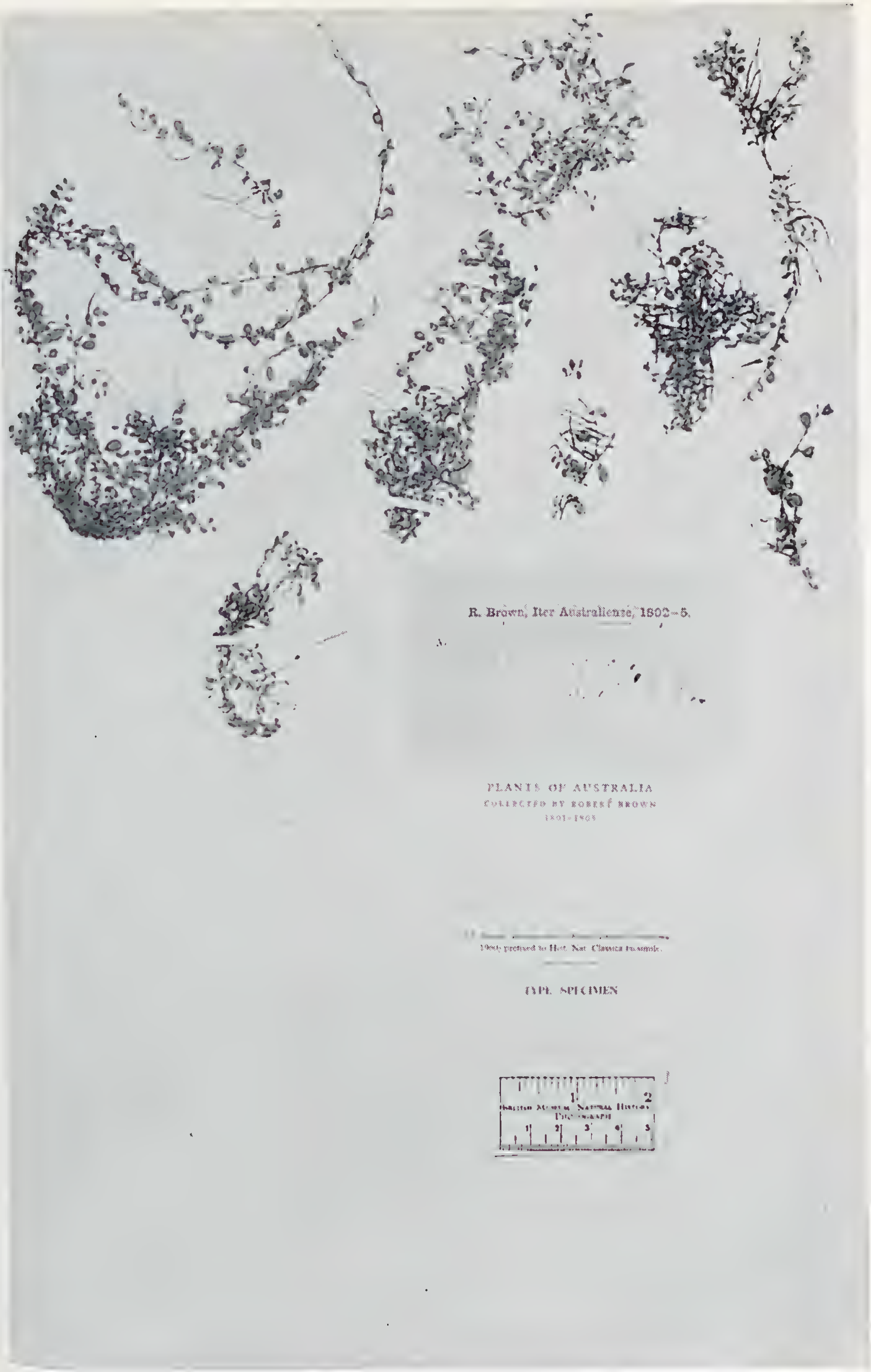
This investigation was carried out during the tenure of a C.S.I.R.O. Senior Postgraduate Studentship. The field trip to New South Wales was partly financed by C.S.I.R.O. together with the Australian Research Grants Commission. I wish to thank the Directors of the National Herbaria of Victoria and New South Wales, the State Herbarium of South Australia, as well as the Government Botanist, Queensland Herbarium, for the loan of specimens. Mr A.S. George kindly examined Robert Brown's collections at The Herbarium, Kew, and the British Museum of Natural History, as well as obtaining photographs of these specimens. Finally my thanks are due to Dr S. James, Dr A.J. McComb and Dr B.G. Briggs for advice on various matters as well as to Mr L.A.S. Johnson and Dr M.D. Tindale for assistance with the Latin descriptions.

Plate V



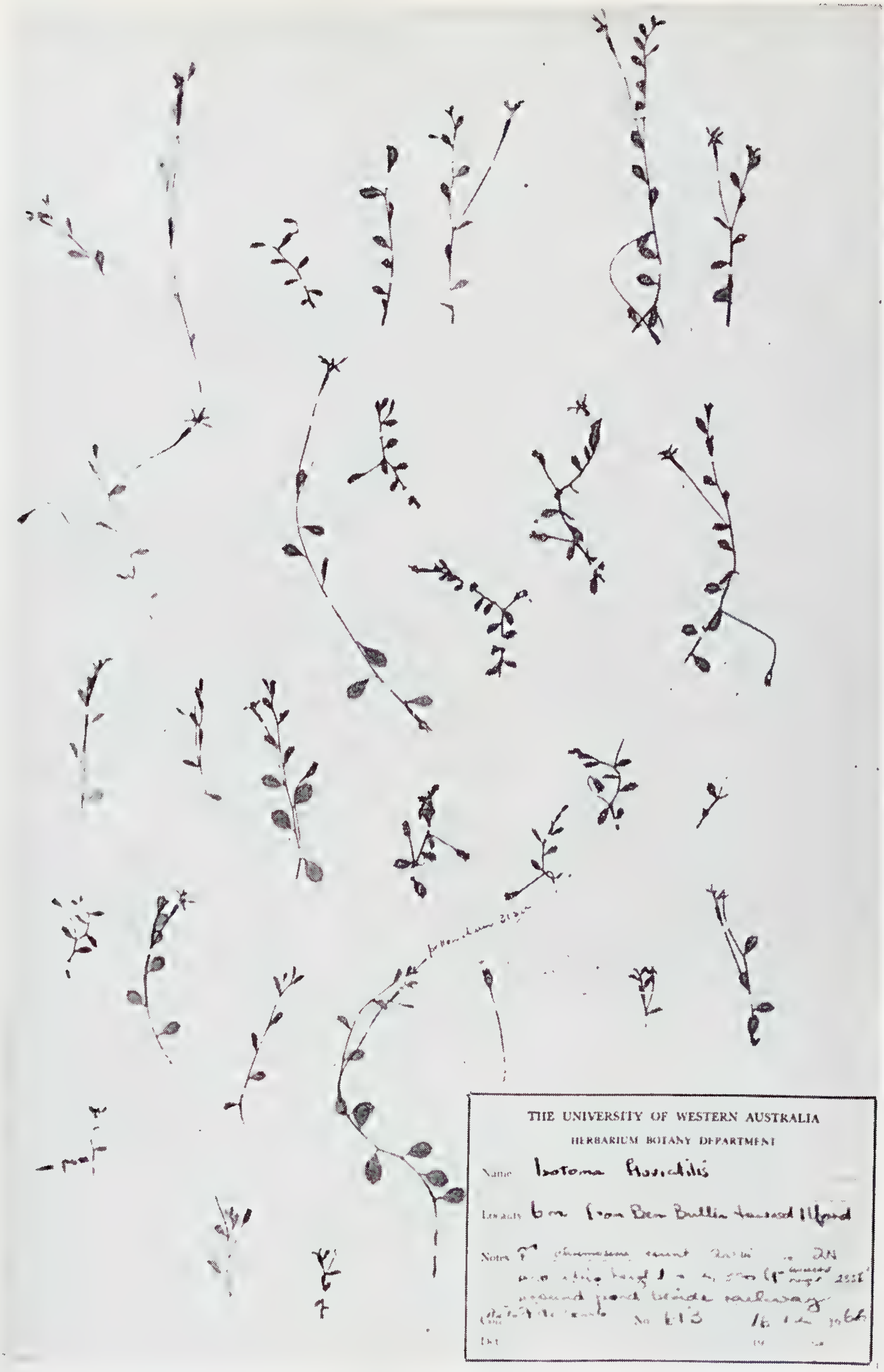
Lectotype of *Isotoma fluviatilis* ssp. *fluviatilis* (female specimen).

Plate VI


R. Brown, Iter Australiense, 1802–5.
PLANTS OF AUSTRALIA
COLLECTED BY ROBERT BROWN
1801–1805
TYPE SPECIMEN
1
2
BRITISH MUSEUM NATURAL HISTORY
PHOTOGRAPH
1
2
3
4
5

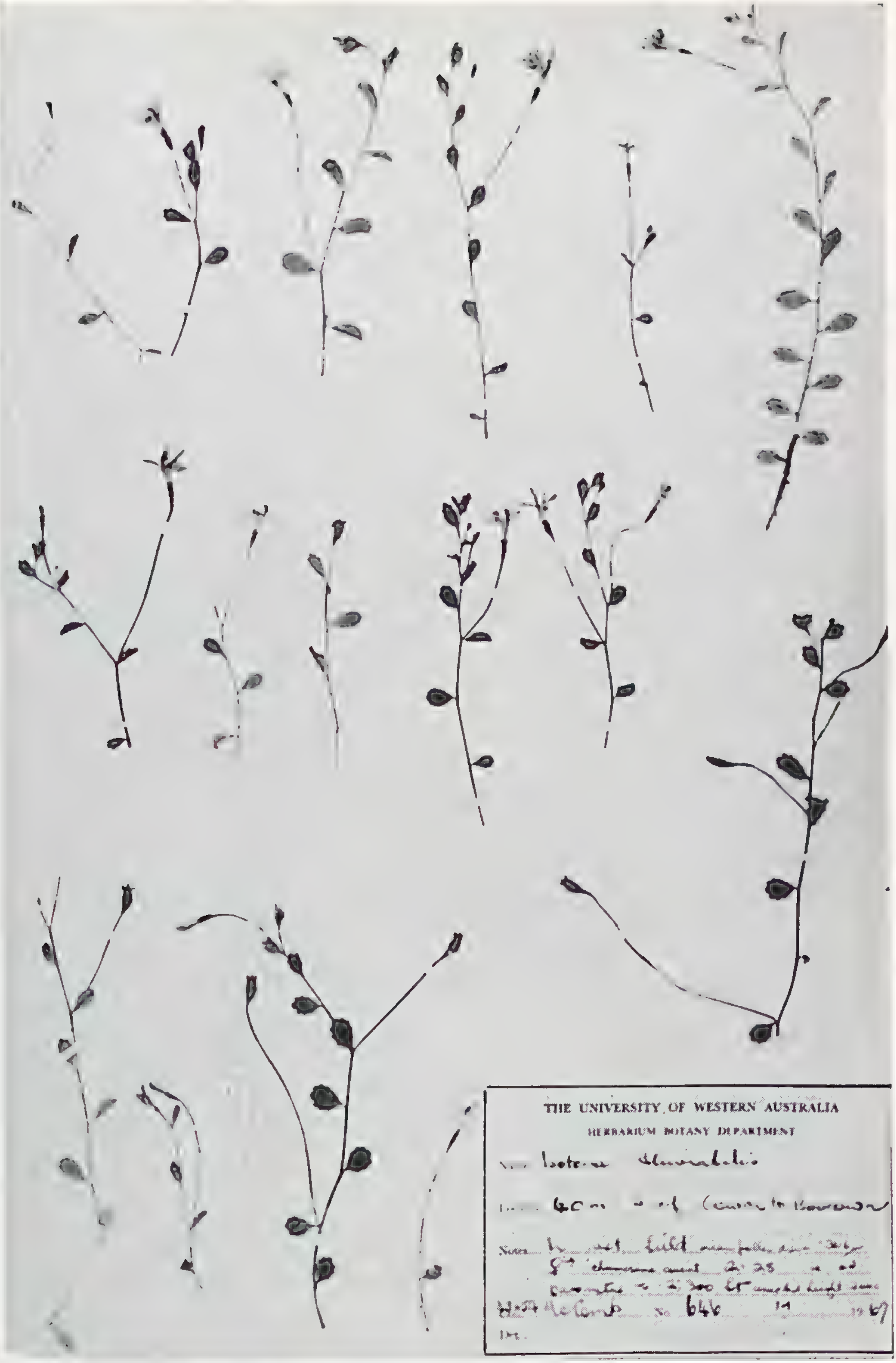
Paratype of *Isotoma fluviatilis* ssp. *fluviatilis* (male specimen).

Plate VII



THE UNIVERSITY OF WESTERN AUSTRALIA
HERBARIUM BOTANY DEPARTMENT
Name Isotoma fluviatilis
Locality 6 m from Ben Bullen toward Ilford
Notes [illegible] chromosome count [illegible] 2N
[illegible] 2558'
[illegible] bridge railway
Coll. [illegible] No 613 16 [illegible] 1966
Det

Holotype of *Isotoma fluviatilis* ssp. *borealis* (diploid hermaphrodite).



THE UNIVERSITY OF WESTERN AUSTRALIA
HERBARIUM BOTANY DEPARTMENT
Isotoma fluviatilis
646 1967

Holotype of *Isotoma fluviatilis* ssp. *australis* (tetraploid hermaphrodite).

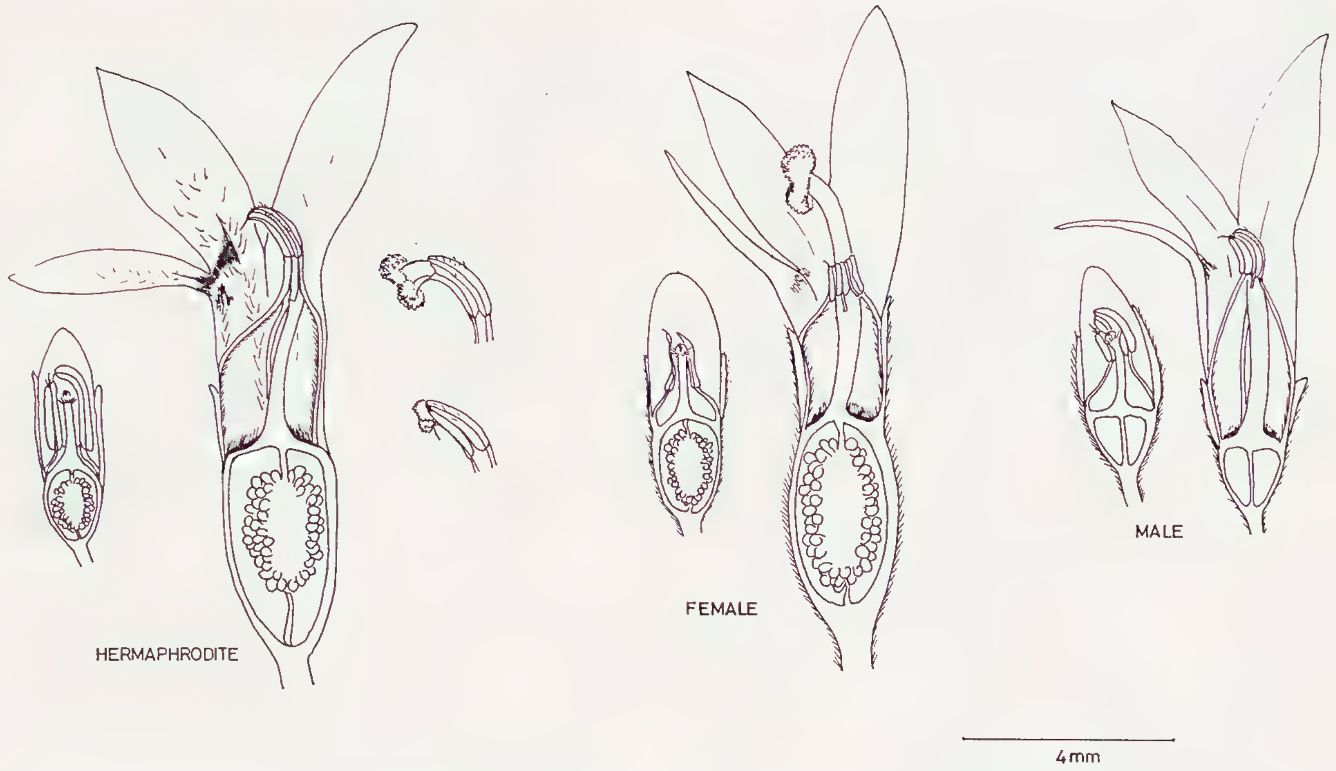


Plate VIII A.—Morphology of diploid hermaphrodite flowers of *Isotoma fluviatilis* ssp. *borealis*, and unisexual flowers of *Isotoma fluviatilis* ssp. *fluviatilis*. The flowers of the tetraploid hermaphrodite (ssp. *australis*) are similar to, but typically larger than, those of ssp. *borealis*.

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A Checklist for the Illustrations of the Botany of Cook's First Voyage

D.J. McGillivray

INTRODUCTION

The first comprehensive botanical publication based exclusively on the Australian collections of Banks and Solander is "Illustrations of the Botany of Captain Cook's Voyage Round the World in H.M.S. Endeavour in 1768–71 by The Right Hon. Sir Joseph Banks, Bart., K.B., F.R.S., and Dr Daniel Solander, F.R.S. With Determinations by James Britten, F.L.S., Senior Assistant, Department of Botany, British Museum. Part I (1900), Part II (1901), Part III [with Introduction] (1905)".

In this review, Britten's determinations and nomenclature have been re-examined, and where necessary, amended to accord with contemporary systematic opinion.

Scholarly accounts of the botanical aspects of the voyage have been published by Dr W.T. Stearn in Endeavour XXVII, 100 (1968) 3–10, and in Notes & Records Roy. Soc. XXIV (1969) 64–90. Dr R.A. Rauschenberg in Trans. Amer. Phil. Soc. n.s. LVIII, part 8 (1968) has presented a critical and well-documented biography of the industrious Dr Solander.

In the following table the names are presented in the numerical sequence of the published descriptions. The name currently accepted for the plant depicted in a particular plate is *either* the name given in the "Original Determinations" column with dashes beside it, *or* the name given in the "Amended Determinations" column, opposite the name used in the original. Names in the "Original Determinations" column are those adopted by Britten, except for some of the accepted names which have been altered slightly to comply with current nomenclatural requirements, e.g. 163, 166. *Elichrysum* to *Helichrysum* (*nomen conservandum*), 293. *Mallotus philippinensis to M. philippensis.* Notes have been given when additional explanatory comment was considered advisable. These appear at the end of the tabulation.

According to Lanjouw & Stafleu in Regnum Vegetabile II, 2 (1954) 53, the specimens collected by Banks and Solander on Cook's Voyage are housed in the following herbaria:— Auckland Institute and Museum, Auckland, New Zealand (AK), 200 New Zealand specimens; Botanisches Museum, Berlin-Dahlem, Germany (B), 40 Australian and 199 New Zealand specimens; British Museum (Natural History), London, England (BM), the original specimens; Botanical Museum and Herbarium, Copenhagen, Denmark (C), 2000 specimens; Central National Herbarium, Calcutta, India (CAL); Royal Botanic Garden, Edinburgh, Scotland (E); Institut für Systematische Botanik und Pflanzengeographie der Martin-Luther-Universität, Halle, Germany (HAL); Royal Botanic Gardens, Melbourne, Australia (MEL); Missouri Botanical Garden, St. Louis, U.S.A. (MO); (NSW); Muséum National d'Histoire Naturelle, Paris, France (P), 423 specimens, also in Herbier-Jussieu (P-JU); U.S. National Museum, Smithsonian Institution (US), 338 Australian and Asian specimens, 84 specimens from Tierra del Fuego; Naturhistoriska Riksmuseum, Stockholm, Sweden (S); The Dominion Museum, Wellington, New Zealand (WELT), 200 specimens; Naturhistorisches Museum, Wien, Austria (W), 277 specimens. There are also a few specimens in the Herbarium, Royal Botanic Gardens, Kew, England.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the considerable assistance of his colleagues at the National Herbarium, Dr J.W. Vickery, Dr M.D. Tindale, Dr B.G. Briggs, Miss N.C. Ford, Mrs A.T. Lee, Mrs J.C. De Nardi, Mr L.A.S. Johnson and Mr O.D. Evans. Valuable assistance was also received from Associate Professor R.C. Carolin, School of Biological Sciences, University of Sydney and Mr P.G. Taylor, Royal Botanic Gardens, Kew, whose studies on the Australian species of *Utricularia* have been hampered by a lack of material from tropical Eastern Australia. The manuscript was read by Dr W.T. Stearn; his constructive remarks and assistance on several aspects of the paper are much appreciated, and it is regretted that some of his suggestions could not be incorporated in this paper.

List of the species included in "Illustrations of the Botany of Captain Cook's First Voyage."

PART I

	Original Determinations	***Amended Determinations***
	DICOTYLEDONS	
	Dilleniaceae	
1.	*Wormia alata*	*Dillenia alata* (R. Br. ex DC.) Martelli
2.	*Hibbertia banksii* (R. Br. ex DC.) Benth.	- - -
3.	*Hibbertia volubilis*	*Hibbertia scandens* (Willd.) Gilg
	Menispermaceae	
4.	*Tinospora smilacina* Benth.	- - -
5.	*Adelioides decumbens*	*Hypserpa decumbens* (Benth.) Diels
	Capparideae	Capparidaceae
6.	*Capparis lucida* (DC.) Benth.	- - -
	Violaceae	
7.	*Viola hederacea* Labill.	- - -
8.	*Calceolaria enneasperma*	*Hybanthus enneaspermus* (L.) F. Muell.
9.	*Calceolaria filiformis*	*Hybanthus filiformis* (DC.) F. Muell.
	Bixineae	Cochlospermaceae
10.	*Maximilianea gillivraei*	*Cochlospermum gillivraei* Benth.
	Pittosporeae	Pittosporaceae
11.	*Pittosporum ferrugineum* Ait.	- - -
	Polygaleae	Polygalaceae
12.	*Salomonia oblongifolia* DC.	- - -
13.	*Polygala longifolia* Poir.	- - -
14.	*Polygala rhinanthoides* Soland. ex Benth.	- - -
15.	*Polygala stenoclada* var. *stenosepala*	*Polygala chinenis* L. sens. lat.

Part 1—continued

16.	*Comesperma secundum* R. Br. ex DC.	- - -
17.	*Comesperma ericinum* DC.	- - -
	Portulacaceae	
18.	*Cosmia quadrivalvis*	*Calandrinia quadrivalvis* F. Muell.
	Malvaceae	
19.	*Abutilon indicum* (L.) Sweet var. *australiense* Hochr. ex J. Britt.	- - -
20.	*Hibiscus radiatus* Cav.	- - -
21.	*Hibiscus normanii* F. Muell.	- - -
	Sterculiaceae	
22.	*Commersonia echinata*	*Commersonia bartramia* (Stickm.) Merr.
	Tiliaceae	
23.	*Triumfetta subpalmata*	*Triumfetta repens* (Bl.) Merr. et Rolfe
	Zygophylleae	Zygophyllaceae
24.	*Tribulus solandri* (R. Br.) F. Muell.	- - -
	Rutaceae	
25.	*Zieria pilosa* Rudge	- - -
26.	*Boronia alulata* Soland. ex Benth.	- - -
27.	*Boronia pinnata* Sm.	- - -
28.	*Boronia parviflora* Sm.	- - -
29.	*Eriostemon buxifolius* Sm.	- - -
30.	*Eriostemon banksii* A. Cunn. ex Endl.	- - -
31.	*Philotheca australis*	*Philotheca salsolifolia* (Sm.) Druce
32.	*Corraea alba*	*Correa alba* Andr. var. *alba*
33.	*Corraea reflexa*	*Correa reflexa* (Labill.) Vent. var. *reflexa*
34.	*Corraea reflexa*	*Correa reflexa* (Labill.) Vent. var. *reflexa*
35.	*Jambolifera laevis*	*Acronychia ?laevis* Forst. et Forst. f. See Note A.
36.	*Micromelum pubescens* var. *glabrescens*	*Micromelum minutum* (Forst. f.) Wight et Arn.
	Meliaceae	
37.	*Synoum glandulosum* (Sm.) A. Juss.	- - -
38.	*Carapa moluccensis*	*Xylocarpus granatum* Koen.
	Stackhousieae	Stackhousiaceae
39.	*Stackhousia viminea* Sm.	See Note B.
40.	*Stackhousia monogyna* Labill.	- - -
	Rhamneae	Rhamnaceae
41.	*Cryptandra amara* Sm.	- - -
	Ampelideae	Leeaceae
41A.	*Leea sambucina*	*Leea brunoniana* C.B. Clarke
	Sapindaceae	
42.	*Dodonaea viscosa* (L.) Jacq. var. *laurina* J. Britt.	- - -

Part 1—continued

43.	*Dodonaea vestita* Hook. var. *glabrescens* Benth. ex J. Britt.	See Note C.
44.	*Distichostemon phyllopterus*	*Distichostemon hispidulus* (Endl.) Baill.
	Anacardiaceae	
45.	*Buchanania muelleri*	*Buchanania arborescens* Bl.
45A.	See Part III Appendix	
46.	*Pleiogynium solandri*	*Pleiogynium timoriense* (DC.) Leenh.
	Leguminosae	Papilionaceae
47.	*Oxylobium cordifolium* Andr.	- - -
48.	*Gompholobium nitidum* R. Br. ex Benth.	- - -
49.	*Jacksonia thesioides* A. Cunn. ex Benth.	- - -
50.	*Aotus villosa*	*Aotus ericoides* (Vent.) G. Don
51.	*Bossiaea heterophylla* Vent.	- - -
52.	*Crotalaria verrucosa* L.	- - -
53.	*Crotalaria calycina* Schrank	- - -
54.	*Lotus australis* Andr.	- - -
55.	*Indigofera linifolia* (L. f.) Retz.	- - -
56.	*Indigofera trifoliata* L.	- - -
57.	*Indigofera viscosa* Lam.	- - -
58.	*Indigofera pratensis* F. Muell.	- - -
59.	*Lamprolobium fruticosum* Benth.	- - -
60.	*Cracca reticulata*	*Tephrosia reticulata* Benth.
61.	*Cracca filipes* var. *latifolia*	*Tephrosia filipes* Benth. var. *latifolia* Benth.
62.	*Cracca purpurea* var. *longifolia*	*Tephrosia purpurea* Pers. var. *longifolia* Benth.
63.	*Sesban aculeatus*	*Sesbania cannabina* (Retz.) Poir.
64.	*Diphaca cochinchinensis*	*Ormocarpum cochinchinense* (Lour.) Merr.
65.	*Damapana conferta*	*Smithia conferta* Sm.
66.	*Glycine tabacina* (Labill.) Benth.	- - -
67.	*Glycine tomentosa*	*Glycine tomentella* Hayata
68.	*Caulinia bimaculata*	*Hardenbergia violacea* (Schneev.) Stearn
69.	*Caulinia retusa*	*Hardenbergia retusa* Benth.
70.	*Caulinia rubicunda*	*Kennedia rubicunda* (Schneev.) Vent.
71.	*Erythrina vespertilio* Benth.	- - -
72.	*Stizolobium giganteum*	*Mucuna gigantea* (Willd.) DC.
73.	*Galactia tenuiflora* (Klein ex Willd.) Wight et Arn.	- - -
74.	*Canavalia maritima* (Aubl.) Thouars	- - -
75.	*Phaseolus mungo*	*Vigna radiata* (L.) Wilczek
76.	*Vigna capensis*	probably *Vigna vexillata* (L.) Benth.
77.	*Vigna lanceolata* Benth.	- - -

Part 1—*continued*

78.	*Atylosia reticulata* (Ait.) Benth.	- - -
79.	*Dolicholus cunninghamii*	*Rhynchosia cunninghamii* Benth.
80.	*Castanospermum australe* A. Cunn. et Fraser ex Hook.	- - -
		Caesalpiniaceae
81.	*Cynometra ramiflora* L.	- - -
		Mimosaceae
82.	*Acacia juniperina*	*Acacia ulicifolia* (Salisb.) Court
83.	*Acacia suaveolens* (Sm.) Willd.	- - -
84.	*Acacia simsii*	*Acacia simsii* A. Cunn. ex Benth. var. *multisiliqua* Benth.
85.	*Acacia complanata*	*Acacia* sp. aff. *homalocl͏ada*
86.	*Acacia longifolia* (Andr.) Willd.	- - -
87.	*Acacia cunninghamii* Hook.	*Acacia cunninghamii* sens. lat.
88.	*Acacia calyculata* A. Cunn. ex Benth.	- - -
89.	*Acacia holosericea* A. Cunn.	- - -
90.	*Acacia discolor*	*Acacia botrycephala* (Vent.) Desf.
91.	*Pithecolobium grandiflorum*	*Abarema grandiflora* (Benth.) Kosterm.
	Rosaceae	
92.	*Parinari nonda* F. Muell. ex Benth.	- - -
	Saxifragaceae	Baueraceae
93.	*Bauera rubioides* Andr. var. *microphylla* (Sieber ex DC.) Sér. ex Benth.	- - -
94.	*Bauera capitata* Sér. ex DC.	- - -
	Droseraceae	
95.	*Drosera binata* Labill.	- - -
		Byblidaceae
96.	*Byblis liniflora* Salisb.	- - -
	Rhizophoreae	Rhizophoraceae
97.	*Ceriops candolleana*	*Ceriops tagal* (Perr.) C.B. Rob.
98.	*Bruguiera gymnorhiza*	*Bruguiera conjugata* (L.) Merr.
99.	*Carallia integerrima*	*Carallia brachiata* (Lour.) Merr.
	Combretaceae	
100.	*Lumnitzera coccinea* Wight et Arn.	- - -

PART II

	Myrtaceae	
101.	*Darwinia fascicularis*	*Darwinia fascicularis* Rudge ssp. *fascicularis*
104 as 102.	*Thryptomene oligandra* F. Muell.	- - -
103.	*Baeckea crenulata*	*Baeckea imbricata* (Gaertn.) Druce

Part 2—continued

102 as 104.	*Baeckea crenulata* var. *tenella*	*Baeckea imbricata* (Gaertn.) Druce
105.	*Leptospermum fabricia* Benth.	---
106.	*Leptospermum scoparium*	*Leptospermum squarrosum* Gaertn.
107.	*Leptospermum stellatum*	now included in *Leptospermum attenuatum* Sm.
108.	*Callistemon lanceolatus*	*Callistemon citrinus* (Curtis) Skeels
109.	*Callistemon rigidus*	*Callistemon viminalis* (Soland. ex Gaertn.) G. Don
110.	*Melaleuca thymifolia* Sm.	---
111.	*Melaleuca angustifolia* Gaertn.	---
112.	*Melaleuca leucadendron*	*Melaleuca quinquenervia* (Cav.) S.T. Blake
113.	*Melaleuca leucadendron*	*Melaleuca viridiflora* Soland. ex Gaertn.
114.	*Melaleuca armillaris* (Soland. ex Gaertn.) Sm.	---
115.	*Melaleuca nodosa* (Soland. ex Gaertn.) Sm.	---
116.	*Eucalyptus alba* Reinw. ex Bl.	---
117.	*Eucalyptus terminalis*	*Eucalyptus crebra* F. Muell.
118.	*Tristania suaveolens* (Soland. ex Gaertn.) Sm.	---
119.	*Rhodomyrtus macrocarpa* Benth.	---
120.	*Fenzlia obtusa* Endl.	---
121.	*Eugenia grandis*	*Syzygium grande* (Wight) Walp.
122.	See Part III Appendix.	
		Lecythidaceae
123.	*Huttum calyptratum*	*Barringtonia calyptrata* (Miers) R. Br. ex F. M. Bail.
124.	*Cumbia australis*	*Planchonia careya* (F. Muell.) R. Knuth
	Lythraceae	
125.	*Rotala decussata*	See Note D.
126.	*Ammannia baccifera* L.	---
127.	*Ammannia auriculata* Willd.	---
128.	*Pemphis acidula* Forst. et Forst. f.	---
	Passifloreae	Passifloraceae
129.	*Passiflora banksii*	*Passiflora aurantia* Forst. et Forst. f.
	Ficoideae	Ficoidaceae
130.	*Halimum portulacastrum*	*Sesuvium portulacastrum* L.
	Umbelliferae	
131.	*Hydrocotyle asiatica*	*Centella asiatica* (L.) Urb.
132.	*Didiscus procumbens*	*Trachymene procumbens* (F. Muell.) Benth.
133.	*Trachymene ericoides*	*Platysace ericoides* (Sieber ex Spreng.) Norman

Part 2—continued

134.	*Trachymene billardieri* var. *ovata*	*Platysace lanceolata* (Labill.) Druce
135.	*Xanthosia pilosa* Rudge	- - -
136.	*Actinotus helianthi* Labill.	- - -
137.	*Actinotus minor* (Sm.) DC.	- - -
	Rubiaceae	
138.	*Oldenlandia mitrasacmoides*	*Hedyotis mitrasacmoides* F. Muell.
139.	*Oldenlandia paniculata* L.	- - -
140.	*Ixora timorensis* Decne.	- - -
141.	*Diplospora ixoroides* F. Muell.	*Ixora* sp. See Note E.
142.	*Nelitris timon*	*Timonius timon* (Spreng.) Merr.
143.	*Scyphiphora hydrophyllacea* Gaertn. f.	- - -
144.	*Canthium coprosmoides* F. Muell.	- - -
145.	*Coelospermum decipiens* Baill.	- - -
146.	*Myrstiphyllum nesophilum*	*Psychotria nesophila* F. Muell.
147.	*Myrstiphyllum loniceroides*	*Psychotria loniceroides* Sieber ex DC.
148.	*Myrmecodia beccarii* Hook. f.	- - -
149.	*Opercularia hyssopifolia*	*Opercularia aspera* Gaertn.
150.	*Pomax umbellata* (Gaertn.) A. Rich.	- - -
151.	*Knoxia stricta* Gaertn.	- - -
152.	*Tardavel marginata*	*Borreria suffruticosa* (R. Br. ex Benth.) Specht
	Compositae	
153.	*Shawia arguta*	*Olearia arguta* Benth.
154.	*Vittadinia australis*	*Vittadinia macrorhiza* (DC.) A. Gray
155.	*Calotis lappulacea* Benth.	- - -
156.	*Pterocaulon sphacelatum* (Labill.) F. Muell.	- - -
157.	*Pterocaulon glandulosum* (F. Muell. ex Benth.) F. Muell.	- - -
158.	*Epaltes australis* Less.	- - -
159.	*Niebuhria spilanthoides*	*Wedelia spilanthoides* F. Muell.
160.	*Niebuhria biflora*	*Wedelia biflora* (L.) DC.
161.	*Spilanthes grandiflora* Turcz.	- - -
162.	*Phacellothrix cladochaeta* (F. Muell.) F. Muell.	- - -
163.	*Helichrysum bracteatum* (Vent.) Andr.	- - -
164.	*Elichrysum banksii*	*Helichrysum bracteatum* (Vent.) Andr.
165.	*Elichrysum albicans*	*Helichrysum elatum* A. Cunn. ex DC. see Note F.
166.	*Helichrysum rupicola* DC.	- - -
167.	*Crossocephalum pseudochina*	*Gynura crossocephalum* (L.) DC.

Part 2—continued

	Stylidieae	Stylidiaceae
168.	*Candollea serrulata*	*Stylidium graminifolium* Sw. ex Willd.
169.	*Candollea alsinoides*	*Stylidium alsinoides* R. Br.
170A.	*Candollea rotundifolia*	*Stylidium rotundifolium* R. Br.
170B.	*Candollea uliginosa*	*Stylidium uliginosum* Sw. ex Willd.
170C.	*Candollea pedunculata*	*Stylidium pedunculatum* R. Br.
	Goodenovieae	Goodeniaceae
171.	*Leschenaultia filiformis* R. Br.	- - -
172.	*Velleia paradoxa* R. Br.	- - -
173.	*Velleia pubescens* R. Br.	- - -
174.	*Goodenia ovata* Sm.	- - -
175.	*Goodenia rotundifolia* R. Br.	- - -
176.	*Goodenia paniculata* Sm.	- - -
177A.	*Goodenia pumilio* R. Br.	- - -
177B.	*Calogyne pilosa* R. Br.	- - -
178.	*Scaevola suaveolens*	*Scaevola calendulacea* (Kennedy) Druce
	Campanulaceae	Lobeliaceae
179.	*Lobelia dentata* Cav.	- - -
180.	*Lobelia membranacea* R. Br.	- - -
181.	*Lobelia purpurascens*	*Pratia purpurascens* (R. Br.) E. Wimm.
182.	*Cervicina gracilis* (Forst. f.) J. Britt.	See Note G.
	Epacrideae	Epacridaceae
183.	*Styphelia viridis* Andr.	See Note H. —
184.	*Styphelia pinifolia*	*Astroloma pinifolium* (R. Br.) Benth.
185.	*Styphelia virgata*	*Leucopogon virgatus* (Labill.) R. Br.
186.	*Styphelia ericoides*	*Leucopogon ericoides* (Sm.) R. Br.
187.	*Styphelia ruscifolia*	*Leucopogon ruscifolius* R. Br.
188.	*Styphelia leptospermoides*	*Leucopogon leptospermoides* R. Br.
189.	*Epacris longiflora* Cav.	- - -
190.	*Epacris microphylla* R. Br.	- - -
191.	*Woollsia pungens* (Cav.) F. Muell.	- - -
	Myrsineae	Myrsinaceae
192.	*Myrsine urceolata*	*Rapanea urceolata* (R. Br.) Mez
	Sapotaceae	
193.	*Sideroxylon brownii*	*Planchonella obovata* (R. Br.) Pierre
194.	*Mimusops kauki*	*Mimusops elengi* L. sens. lat.
	Oleaceae	
195.	*Jasminum simplicifolium*	*Jasminum volubile* Jacq.
196.	*Olea paniculata* R.Br.	- - -
197.	*Mayepea axillaris*	*Linociera axillaris* (R. Br.) Knobl.
	Apocyneae	Apocynaceae
198.	*Gynopogon spicatum*	*Alyxia spicata* R. Br.
199.	*Parsonsia velutina* R. Br.	- - -

Part 2—continued

	Asclepiadeae	Asclepiadaceae
200.	*Sarcostemma australe* R. Br.	- - -
201.	*Cynanchum erubescens* R. Br.	- - -
202.	*Dischidia nummularia* R. Br.	- - -
203.	*Hoya australis* R. Br. ex Traill	- - -
	Loganiaceae	
204.	*Mitrasacme polymorpha* R. Br.	- - -
205.	*Mitrasacme ambigua* R. Br.	- - -
206.	*Mitrasacme connata* R. Br.	- - -
207.	*Mitrasacme stellata* R. Br.	- - -
208A.	*Mitrasacme pygmaea* R. Br.	- - -
208B.	*Mitrasacme laricifolia* R. Br.	- - -
	Gentianeae	Gentianaceae
209.	*Canscora diffusa* (Vahl) R. Br. ex Roem. et Schult.	- - -
	Boragineae	Boraginaceae
210.	*Tournefortia sarmentosa* Lam.	- - -
211.	*Borraginoides zeylanica*	*Trichodesma zeylanicum* (Burm. f.) R. Br.
	Convolvulaceae	
212.	*Ipomoea longiflora* R. Br.	- - -
213.	*Ipomoea congesta*	*Ipomoea indica* (Burm.) Merr., See Note J.
214.	*Merremia hastata*	*Merremia tridentata* (L.) Hall. f. ssp. *hastata* (Desr.) Ooststr.
215.	*Lepistemon fitzalanii*	*Lepistemon urceolatus* (R. Br.) F. Muell.
216.	*Jacquemontia multivalvis*	*Jacquemontia paniculata* (Burm. f.) Hall. f.
	Scrophularineae	Scrophulariaceae
217.	*Mimulus uvedaliae* Benth.	- - -
218.	*Adenosma coerulea* R. Br.	- - -
219.	*Lindernia subulata* R. Br.	- - -
220.	*Razumovia hispida*	*Centranthera cochinchinensis* (Lour.) Merr.
221.	*Buchnera tetragona* R. Br.	- - -
	Lentibularieae	Lentibulariaceae
222A.	*Utricularia pygmaea* Banks et Soland. ex R. Br.	- - -
222B.	*Utricularia albiflora* Banks et Soland. ex R. Br.	- - -
223A.	*Utricularia chrysantha* R. Br.	- - -
223B.	*Utricularia flava* Banks et Soland. ex R. Br.	- - -
224.	*Utricularia barbata* Banks et Soland. ex R. Br.	- - -
225.	*Utricularia cyanea* R. Br.	*Utricularia uliginosa* Vahl

Part 2—continued

226A.	*Utricularia biloba* R.Br.	- - -
226B.	*Utricularia limosa* Banks et Soland. ex R.Br.	- - -
227A, B, 222C.	*Utricularia baueri* R. Br.	*Utricularia caerulea* L.
	Bignoniaceae	
228.	*Tecoma australis*	*Pandorea pandorana* (Andr.) Steen.
229.	*Diplanthera tetraphylla*	*Deplanchea tetraphylla* (R. Br.) F. Muell.
	Pedalineae	Pedaliaceae
230.	*Josephinia grandiflora*	*Josephinia imperatricis* Vent.
	Acanthaceae	
231.	*Nelsonia campestris*	*Nelsonia canescens* (Lam.) Spreng.
232.	*Hygrophila angustifolia*	*Hygrophila salicifolia* (Vahl) Nees
233, 234.	*Justicia procumbens*	*Rostellularia pogonanthera* F. Muell. See Note K.
235.	*Eranthemum variabile*	*Pseuderanthemum variabile* (R. Br.) Radlk. ex Lindau
	Myoporineae	Myoporaceae
236.	*Myoporum tenuifolium*	*Myoporum acuminatum* R. Br.
	Verbenaceae	
237.	*Callicarpa pedunculata* R. Br.	- - -
238.	*Gmelina macrophylla* (R. Br.) Benth.	- - -
239.	*Siphonanthus floribundus*	*Clerodendrum floribundum* R. Br.
	Labiatae	
240.	*Germanea australis*	*Plectranthus graveolens* R. Br.
241.	*Hemigenia purpurea* R. Br.	- - -
242.	*Westringia rosmariniformis*	*Westringia fruticosa* (Willd.) Druce
243.	*Ajuga australis* R. Br.	- - -

PART III

	Chenopodiaceae	
244.	*Rhagodia billardieri*	*Rhagodia baccata* (Labill.) Moq.
245.	*Salsola kali* L.	- - -
	Amarantaceae	
246.	*Deeringia celosioides*	*Deeringia amaranthoides* (Lam.) Merr
247.	*Deeringia altissima*	*Deeringia arborescens* (R. Br.) Druce
	Polygonaceae	
248.	*Polygonum articulatum* R. Br.	- - -
249.	*Muehlenbeckia rhyticarya* F. Muell. Plate caption *M. adpressa* in error.	- - -
	Piperaceae	
250.	*Piper betle*	*Piper mestonii* F.M. Bail.

Part 3—continued

	Myristicaceae	
251.	*Myristica cimicifera*	*Myristica insipida* R. Br.
	Laurineae	Lauraceae
252.	*Endiandra glauca* R. Br.	- - -
	Proteaceae	
253.	*Atylus anethifolius*	*Isopogon anethifolius* (Salisb.) Knight
254.	*Atylus anemonifolius*	*Isopogon anemonifolius* (Salisb.) Knight
255.	*Symphionema paludosum* R. Br.	- - -
256.	*Linkia falcata*	*Persoonia falcata* R. Br.
257.	*Linkia laevis*	*Persoonia levis* (Cav.) Domin
258.	*Linkia lanceolata*	*Persoonia lanceolata* Andr.
259.	*Xylomelum pyriforme* (Gaertn.) Knight	- - -
260.	*Lambertia formosa* Sm.	- - -
261.	*Grevillea pteridifolia* Knight	- - -
262.	*Grevillea cinerea*	*Grevillea mucronulata* R. Br., a form
263.	*Grevillea parallela* Knight	- - -
264.	*Grevillea glauca* Knight	- - -
265.	*Hakea pugioniformis*	*Hakea teretifolia* (Salisb.) J. Britt.
266.	*Hakea gibbosa* (Sm.) Cav.	- - -
267.	*Hakea dactyloides* (Gaertn.) Cav.	- - -
268.	*Isostylis ericifolia*	*Banksia ericifolia* L. f.
269.	*Isostylis integrifolia*	*Banksia integrifolia* L. f.
270.	*Isostylis serrata*	*Banksia serrata* L. f.
271.	*Isostylis dentata*	*Banksia dentata* L. f.
	Thymelaeaceae	
272.	*Banksia cornucopiae*	*Pimelea cornucopiae* Vahl
273.	*Banksia linifolia*	*Pimelea linifolia* Sm.
	Loranthaceae	
274.	*Loranthus longiflorus*	*Dendrophthoë vitellina* (F. Muell.) Tiegh.
275.	*Loranthus pendulus*	*Amyema pendulum* (Sieber ex Spreng.) Tiegh.
276.	*Loranthus pendulus* var.	*Decaisnina brittenii* (Blakely) B. Barlow
	Santalaceae	
277.	*Santalum oblongatum*	*Santalum lanceolatum* R. Br.
278.	*Anthobolus triqueter*	*Anthobolus filifolius* R. Br.
279.	*Exocarpos latifolius* R. Br.	- - -
280.	*Exocarpos cupressiformis* Labill.	- - -
	Euphorbiaceae	
281.	*Euphorbia atoto* Forst. f.	- - -
282.	*Euphorbia mitchelliana* Boiss.	- - -
283.	*Euphorbia serrulata*	*Euphorbia macgillivrayi* Boiss.
284.	*Poranthera microphylla* Brongn.	- - -

Part 3—*continued*

285.	*Beyeria opaca*	*Beyeria tristigma* F. Muell.
286.	*Petalostigma banksii* J. Britt. et S. Moore	- - -
287.	*Phyllanthus hebecarpus* Benth.	- - -
288.	*Phyllanthus dallachyanus* Benth.	- - -
289.	*Neoroepera banksii* Benth.	- - -
290.	*Claoxylon hillii* Benth.	- - -
291.	*Tragia novae-hollandiae* J. Muell.	- - -
292.	*Mallotus claoxyloides* var. *ficifolia*	*Mallotus claoxyloides* (F. Muell.) J. Muell. var. *claoxyloides*
293.	*Mallotus philippensis* (Lam.) J. Muell.	- - -
294.	*Mallotus polyadenus* F. Muell.	- - -
295.	*Macaranga involucrata* (Roxb.) Baill.	- - -
296.	*Omalanthus leschenaultianus*	*Omalanthus populifolius* R. Grah.
	Urticeae	Urticaceae
*297.	*Celtis paniculata* (Endl.) Planch.	- - - [family Ulmaceae]
*298.	*Laportea moroides*	*Dendrocnide moroides* (Wedd.) Chew

MONOCOTYLEDONS

	Orchidaceae	
299.	*Dendrobium undulatum*	*Dendrobium discolor* Lindl.
300.	*Dendrobium canaliculatum* R. Br.	- - -
301.	*Dendrobium rigidum* R. Br.	- - -
302A.	*Prasophyllum striatum* R. Br.	- - -
302B.	*Pterostylis revoluta* R. Br.	- - -
	Burmanniaceae	
302C.	*Burmannia juncea* Soland. ex R. Br.	- - -
	Haemodoraceae	
303.	*Haemodorum corymbosum* Vahl	- - -
	Liliaceae	
304.	*Dianella caerulea* Sims	- - -
305.	*Eustrephus latifolius* R. Br. var. *latifolius*	- - - [family Philesiaceae]
306.	*Eustrephus latifolius* R. Br. var. *angustifolius* (R. Br.) Benth.	- - - [family Philesiaceae]
307.	*Blandfordia nobilis* Sm.	- - -
308.	*Schelhammera multiflora* R. Br.	- - -

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* Numbering of these plates reversed.

Part 3—continued

309.	*Chlamysporum banksii*	*Thysanotus tuberosus* R. Br.
	Philydraceae	
310.	*Philydrum lanuginosum* Gaertn.	- - -
	Commelinaceae	- - - *Cartonema* now in Cartonemataceae
311.	*Cartonema spicatum* var. *humilis*	*Cartonema spicatum* R. Br. var. *spicatum*
	Juncaceae	
312.	*Lomandra longifolia* Labill.	- - - *Lomandra* and *Xanthorrhoea* now in family Xanthorrhoeaceae.
313.	*Lomandra multiflora* (R. Br.) J. Britt.	- - -
314.	*Lomandra filiformis*	*Lomandra laxa* (R. Br.) Lee
315.	*Xanthorrhoea hastilis*	*Xanthorrhoea resinosa* Pers.
	Juncagineae	Juncaginaceae
316.	*Triglochin procera* R. Br.	- - -
	Eriocauleae	Eriocaulaceae
317.	*Eriocaulon fistulosum* R. Br.	- - -
	Gramineae	
318.	*Leptaspis banksii* R. Br.	

APPENDIX

	Anacardiaceae	
45A.	*Blepharocarya involucrigera* F. Muell.	- - - See Note L
	Myrtaceae	
122.	*Eugenia banksii*	- - - See Note M

NOTES

Note A. 35. *Jambolifera laevis.* Until the relationships of the *Acronychia* species from Oceania have been studied, the identity of the plant figured in Plate 35 will remain in doubt. (D. J. McGillivray.)

Note B. 39. *Stackhousia viminea.* The illustration represents a species included by Pampanini in Bull. Herb. Boiss. V (1905) 1059 under *S. scoparia* Benth. However, *S. scoparia* was described from material collected in Western Australia and is distinct from the collections from New South Wales (see also Mattfield in Engler & Prantl, Nat. Pflanzenf. XXb (1942) 252). The species from New South Wales may be *S. nuda* Lindl. Comparison with the Type collection is desirable. (Personal communication by N. C. Ford.)

Note C. 43. *Dodonaea vestita* var. *glabrescens.* The status of *Dodonaea vestita* Hook. var. *glabrescens* Benth. ex J. Britt. requires further study. As Bentham indicated in Fl. Austral. I (1863) 484, it differs from the type variety in the indumentum and shape of the leaflets as well as in the indumentum and shape of the fruits. This degree of difference suggests that it may be an undescribed species or a hybrid, although hybrid origin is unlikely, because the variety was collected by Cunningham; also the species known to occur in the Endeavour River area would not produce a hybrid of this form. (D. J. McGillivray.)

Note D. 125. *Rotala decussata.* The material illustrated under this name consists in part (fig. 125A) of *Rotala densiflora* (Roth. ex Roem. et Schult.) Koehne, and in part (fig. 125B) of a possibly unnamed species which does not appear to be amongst the Australian species recorded by Koehne in his monograph, Pflanzenreich IV (1903) 216, Lythraceae. (Personal communication J. C. De Nardi and L. A. S. Johnson.)

Note E. 141. *Diplospora ixoroides.* A note on the nomenclature of *Ixora triflora* Benth. will be published separately at a later date. The legitimacy of *Ixora queenslandica* Fosberg as a new name for (or a new species identical with) *I. triflora* sensu R. Br. is doubtful. (D. J. McGillivray.)

Note F. 165. *Elichrysum albicans.* The plant depicted in the plate is typical *Helichrysum elatum* A. Cunn. ex DC. However, the single sheet in the National Herbarium of New South Wales represents a northern form with more glabrous, crowded leaves. (Personal communication by N. C. Ford.)

Note G. 182. *Cervicina gracilis.* The specimen illustrated in Plate 182 appears to be *Wahlenbergia communis* Carolin. Banks and Solander collection in the British Museum of Natural History includes both *W. communis* and *W. gracilis* (Forst. f.) Schrad.; the single sheet in the National Herbarium of New South Wales is *W. gracilis.* There is no indication of the locality of collection for the specimen illustrated, nor is it clear from which of the several cited localities the specimens in the National Herbarium of New South Wales were obtained. *Cervicina gracilis* (Forst. f.) J. Britt. is based on *Campanula gracilis* Forst. f. and is therefore a synonym of *W. gracilis*, even though this is not the species illustrated. (Personal communication by R. C. Carolin.)

Note H. 183. *Styphelia viridis.* The specimen in the National Herbarium of New South Wales, collected at Botany Bay, is *S. viridis*, although the plate is more like *S. triflora* with leaves tapering to the apex and the flowers borne towards the ends of the branches. (Personal communication by N. C. Ford.)

Note J. 213. *Ipomoea congesta.* In Blumea III (1940) 500–503 Van Ooststroom uses the name *I. congesta* R. Br. for this species on the grounds that the identity of *Convolvulus indicus* Burm. (based on the pre-Linnaean *C. coeruleus* Rumph.) is somewhat doubtful, having been referred both to *I. nil* (L.) Roth (by Hallier) and to *I. congesta* (by Merrill). However, careful comparison leads me to agree with Merrill (Interpr. Rumph. Herb. Amb. (1917) 445) that Rumphius's description fits *I. congesta* much better than *I. nil.* Since *C. indicus* Burm. clearly refers to one or both of these species and his epithet has priority, and Merrill's interpretation is tantamount to a selection (on good grounds) of a typical element, the name *I. indica* should be retained. There is no reason to regard it as a *nomen ambiguum* or *nomen confusum.* Verdcourt (in Taxon VI (1957) 231 and VII (1958) 84) discusses further synonymy and confusion of names surrounding this species but he neglects to mention *C. indicus* Burm., which still provides the earliest available epithet. (Personal communication by L. A. S. Johnson.)

Note K. 233, 234. *Justicia procumbens.* These two plates represent species of *Rostellularia.* Bremekamp (Acta Bot. Néerl. XI (1962) 197–8 "Remarks on the Position of Some Australian Acanthaceae") considers that *J. juncea* R. Br., *J. media* R. Br. and *J. adscendens* R. Br., probably belong to *Rostellularia pogonanthera* F. Muell. However, he does not seem to have reviewed the Australian species in detail, and so the position must remain open until a detailed taxonomic study is made. (Personal communication by J. De Nardi.)

Note L. Appendix 45A. *Blepharocarya involucrigera.* For discussion of the familial position of the genus *Blepharocarya* see Airy-Shaw in Kew Bull. XVIII, 2 (1965) 254, in which he proposes the family Blepharocaryaceae. (D. J. McGillivray.)

Note M. 122. *Eugenia banksii.* The generic position of this species requires re-examination, but at present it is considered inappropriate to add a new combination to the Myrtoideae until generic limits have been more definitely established. (D. J. McGillivray.)

Some Chromosome Numbers in the Oleaceae

Barbara G. Briggs

SUMMARY

Chromosome numbers are reported for species of *Jasminum*, *Schrebera*, *Olea*, *Linociera*, *Notelaea*, *Nestegis*, *Osmanthus*, and *Picconia*. All counts in *Jasminum* ($x = 13$) and the Oleoideae ($x = 23$) agree with base numbers previously reported in these groups. *Schrebera* had previously been tentatively placed in the rather heterogeneous Jasminoideae but also has $n = 23$.

The majority of chromosome counts reported here were made on material collected by Mr P.S. Green of the Royal Botanic Gardens, Kew (formerly of the Arnold Arboretum) in the course of his extensive revisionary studies in the Oleaceae. Most counts were made on flower buds fixed in the field. However, as meiotic stages were rarely found, somatic divisions were generally used, with a pre-fixation treatment of *c.* 2¼ hours in saturated aqueous *p*-dichlorobenzene. Results were obtained from various floral parts: petals, very young stages of anthers and ovaries, or occasionally staminal filaments which sometimes still included dividing cells in post-meiotic flowers. Root-tip material was studied in *Schrebera.* Fixation was with 3: 1 ethanol : acetic acid, followed by staining with carmine (Snow 1963) or aceto-orcein.

Voucher specimens for Mr Green's collections have been placed in the Herbarium of the Arnold Arboretum and other vouchers are in the National Herbarium of New South Wales. Unfortunately no voucher could be obtained for *Schrebera trichoclada.* Green (1962, 1963a, 1963b, 1965, 1966, 1968) treats many of the species included in this study.

The chromosome numbers presented in Table I and Figs. 1–5 include the first determinations on *Schrebera*, *Nestegis* and *Picconia*, all of which have $2n = 46$. The chromosomes of *Schrebera*, particularly *S. alata*, are somewhat smaller than those of other genera studied. The counts on *Linociera* were mentioned by Green (1966) but are included here to give details of the material used. A previous count on *Notelaea ovata* R. Br. (Briggs in Green 1968) was approximate only.

The numbers in *Jasminum* ($x = 13$) and the whole subfamily Oleoideae ($x = 23$) each continue to show very considerable uniformity, as recorded by Taylor (1945) and supported by most subsequent published counts.

The observation of $2n = 46$ in *Schrebera alata* and *S. trichoclada* is noteworthy. Chromosome counts on *Comoranthus*, the only other genus referred to the Schrebereae, would be of interest. Johnson (1957) indicated that the Schrebereae differed morphologically from the Oleoideae as defined in his treatment, and provisionally placed the Schrebereae in the heterogeneous Jasminoideae, rather than the relatively coherent Oleoideae. The constancy of $x = 23$ in the Oleoideae and the absence of this number in allied groups, together with considerations of morphology and possible phylogeny, led Taylor (1945) to conclude, that "all members of the 23-chromosome group very probably have a common origin from an allopolyploid ancestor". Although this number may have developed independently in *Schrebera*, its occurrence suggests that this genus may in fact be most appropriately included in the Oleoideae. Such a change would, of course, call for some re-definition of the characters of that subfamily.

TABLE I. CHROMOSOME NUMBER DETERMINATIONS

Species	*n*	2*n*	Locality	Voucher*
Jasmium artense Montr.	..	26	Dumbéa Valley, New Caledonia.	PSG 1250
J. leratii Schlechter	..	26	Dôme de Tiebaghi, New Caledonia.	PSG 1802
	..	26	Cultivated, R.B.G.† Sydney	NSW 2355
J. volubile Jacq.	..	26	Mt. Eliza, Lord Howe Is.	PSG 1580
	..	26	Mt. Bates, Norfolk Is.	PSG 1392
Schrebera alata (Hochst.) Welw.	..	46	Seed ex N.B.G.‡ Kirstenbosch, South Africa. Cult. R.B.G. Sydney.	NSW 103044
S. trichoclada Welw.	..	..	Seed ex Lochinvar Ranch near Monzi, Rhodesia.	..
	..	46	Cult. Arn. Arb. 331–66	..
	..	46	Cult. R.B.G.† Sydney	..
Olea paniculata R. Br.	23	..	Glenugie Peak, S of Grafton, N.S.W.	PSG 1523
Linociera brachystachys (Schlechter) P. S. Green	..	*c.* 46	Mt. Ignambi, New Caledonia	PSG 1798
L. quadristaminea (F. Muell.) Knobl.	..	46	Mt. Lidgbird, Lord Howe Is.	PSG 1677
	..	46	Erskine Valley, Lord Howe Is.	PSG 1647
Notelaea longifolia Vent.	23	..	Rhodes, N.S.W.	NSW 71579
N. microcarpa R. Br.	..	46	Mt. Nombi, SW of Mullaley, N.S.W.	NSW 102581
N. ovata R. Br.	23	..	Rhodes, N.S.W.	NSW 71578
Nestegis montana (Hook. f.) L. Johnson	..	46	Wairarapa, New Zealand	PSG 1354
Osmanthus austro-caledonicus (Vieill.) Knobl., long narrow-leaved form, [*O. badula* (Vieill.) Hutchinson ex S. Moore]	..	46	R. Dumbéa, New Caledonia	PSG 1142
O. austro-caledonicus, intermediate form, [*O. collinus* (Schlechter) Knobl.]	..	46	R. Dumbéa, New Caledonia	PSG 1154
O. austro-caledonicus, short broad-leaved form (*O. vaccinioides* (Schlechter) Hochr.]	..	46	Near Col de Mouirange, New Caledonia.	PSG 1252
Picconia excelsa (Ait.) DC.	23	46	Cultivated, R.B.G. Sydney	NSW 87513

* Numbers prefixed by "PSG" are the collection numbers of Mr P.S. Green; other numbers are registration numbers of specimens at the National Herbarium of New South Wales.

† R.B.G., refers to the Royal Botanic Gardens, Sydney.

‡ N.B.G., refers to the National Botanic Garden, Kirstenbosch.

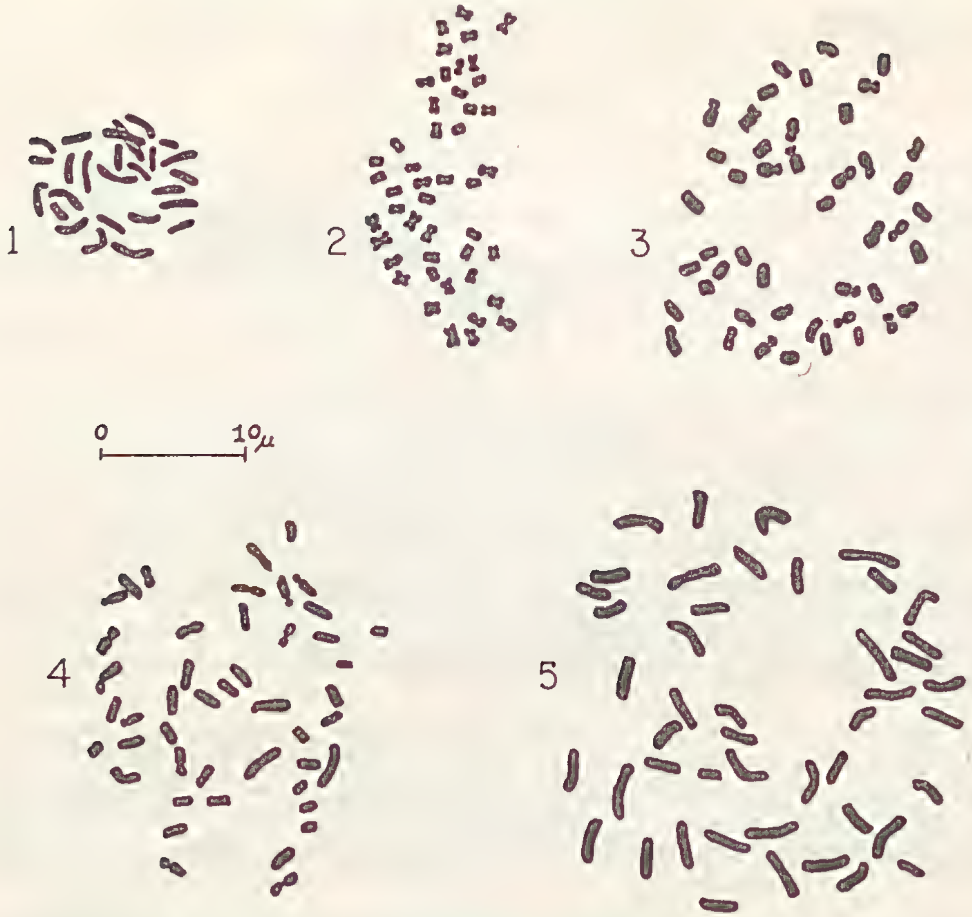

Fig. 1–5 Mitotic chromosomes, × 1700. (1–4 metaphase, 5 late prophase).

1. *Jasminum leratii* $2n = 26$.
2. *Schrebera alata* $2n = 46$.
3. *Schrebera trichoclada* $2n = 46$.
4. *Notelaea microcarpa* $2n = 46$.
5. *Picconia excelsa* $2n = 46$.

ACKNOWLEDGEMENTS

I wish to thank Mr P.S. Green, of the Kew Herbarium, for the fixed collections on which most of this work was based, and for his encouragement and helpful advice. Field work by Mr Green was supported by the National Science Foundation (Grant No. G. B. 1545) and the Arnold Arboretum. I am also most grateful to my colleague Mr L.A.S. Johnson for many helpful discussions.

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Chromosome Numbers In Some Australian Species of *Eleocharis* (Cyperaceae)

Barbara G. Briggs

SUMMARY

Chromosome numbers have been determined for 12 species of *Eleocharis* native in Australia and for the naturalised *E. pachycarpa*. *E. sphacelata* ($2n$ = c. 94–100, 140, 157, 176–184, 188, all approximate counts) and *E. equisetina* ($2n$ = c. 172, one count only) of Series *Mutatae*, have very small chromosomes. Other species have euploid levels based on $x = 5$, from diploid to octoploid. In *E. acuta* $2n = 40$ is reported in Australia but $2n = 20$ for New Zealand material. A list of chromosome numbers in the genus is given.

The chromosomes of *Eleocharis* have been the subject of much investigation. Attention has been directed particularly to the notable variation in chromosome number within some species of the difficult, mainly Northern Hemisphere, Series *Palustriformes* Subseries *Palustres*) and to unusual features of chromosome behaviour associated with the diffuse centromeric organisation. However, much of the genus has received little or no cytological study and there are no reports of chromosome numbers from Australian material.

The Australian and New Zealand species of *Eleocharis* were revised by Blake (1939). Those occurring in New South Wales are under study by my colleagues L.A.S. Johnson and O.D. Evans who are preparing the account of the genus for the Flora of New South Wales.

Chromosome numbers were determined on root-tip material, using a prefixation treatment of *c.* 2¼ hours in saturated aqueous *p*-dichlorobenzene, followed by carmine staining (Snow 1963). Voucher specimens are deposited in the National Herbarium of New South Wales.

Most of the species studied have euploid numbers based on $x = 5$, which appears to be the primary base number of the genus. However, the observations presented in Table I and Figs. 1–9 show a clear division into two groups on chromosome size and number and on the infraspecific stability of the chromosome number.

E. sphacelata and *E. equisetina* are members of the largely tropical and subtropical Series *Mutatae.* This group is more distinctive morphologically than other series and has sometimes been regarded as a separate genus or subgenus.

Exact counts could not be obtained on these two species, as the problems due to small size and high number are increased by the somewhat diffuse form of the chromosomes at mitotic metaphase. However, the numbers were constant, within the limits of accuracy of the observations, in cells from different roots of an individual plant. The present results, using only a single plant of *E. sphacelata* at each locality sampled, are quite inadequate to show whether there is any regularity in the geographic distribution of the various numbers. Little value can be placed on the particular level reported for the single count on *E. equisetina*, as this species may also have similar variation. *E. sphacelata* shows a considerable range of plant size but this apparently depends largely on environmental conditions and present information does not indicate any association between high chromosome number and large size.

TABLE I. CHROMOSOME NUMBER DETERMINATIONS

Localities are within New South Wales unless otherwise indicated; voucher specimens are listed by their herbarium registration numbers.

Species	2*n*	Locality	Voucher
Eleocharis sphacelata R. Br.	94–100	Roberts Creek, nr. Colo R.	99495
	c. 140	S of Nerriga	92494
	c. 157	Valley Heights	91399
	176–184	Fawcetts Plain nr. Kyogle	90479
	c. 188	Woodford	82218
E. equisetina Presl	*c.* 172	Mooneba, W of Kempsey	64425
E. pusilla R. Br.	30	Glenfield	72511
E. atricha R. Br.	20	Glenfield	72514
E. caribaea (Rottb.) S. F. Blake ‡	10	Adelaide R., N. Territory	75445
E. minuta Boeck.	20	nr. Bulahdelah	62243
E. pachycarpa Desv.	40	Centennial Park, Sydney	89680
E. gracilis R. Br.	20	10 miles SE of Howes Valley, SW of Singleton	78806, 78807
	20	Kurnell	91391
	20	Sassafras, SW of Nowra	92493
E. dietrichiana Boeck.	30	Wilsons Downfall, N of Tenterfield	90475
	30	Glenfield	72515
	30	Doonside, W of Sydney	103082, 103103
E. acuta R. Br.	20	Lake Lyndon, W of Christchurch, New Zealand.	90803
	20	Lake Gunn, nr. Cascade Creek, New Zealand.	100684
	40	Fawcetts Plain near Kyogle	90478, 90480
	40	Marsden, NE of West Wyalong	85326
	40	Lake George	68991
	40	10 miles S of Captains Flat	89774
	40	Big Badja R., NE of Cooma	89775
	40	Wilsons Valley, Kosciusko	75448
E. plana S.T. Blake	40	Canberra, A.C.T.	91108
E. pallens S.T. Blake	40	24 miles S of Hay	118238
E. cylindrostachys Boeck.	20	Doonside, W of Sydney	103083
	20	Glenfield	72513

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‡ In Australian Literature (e.g. Blake 1939) this species has been known as *E. geniculata* (L.) Roem. and Schult. The name *E. caribaea* is adopted following Svenson (1957, pp. 520, 533) who rejects *S. geniculata* as, in effect, a *nomen ambiguum*, a procedure in accordance with Article 69 of the International Code of Botanical Nomenclature.

Fig. 1–9. Mitotic chromosomes, × 1650, see list on opposite page.

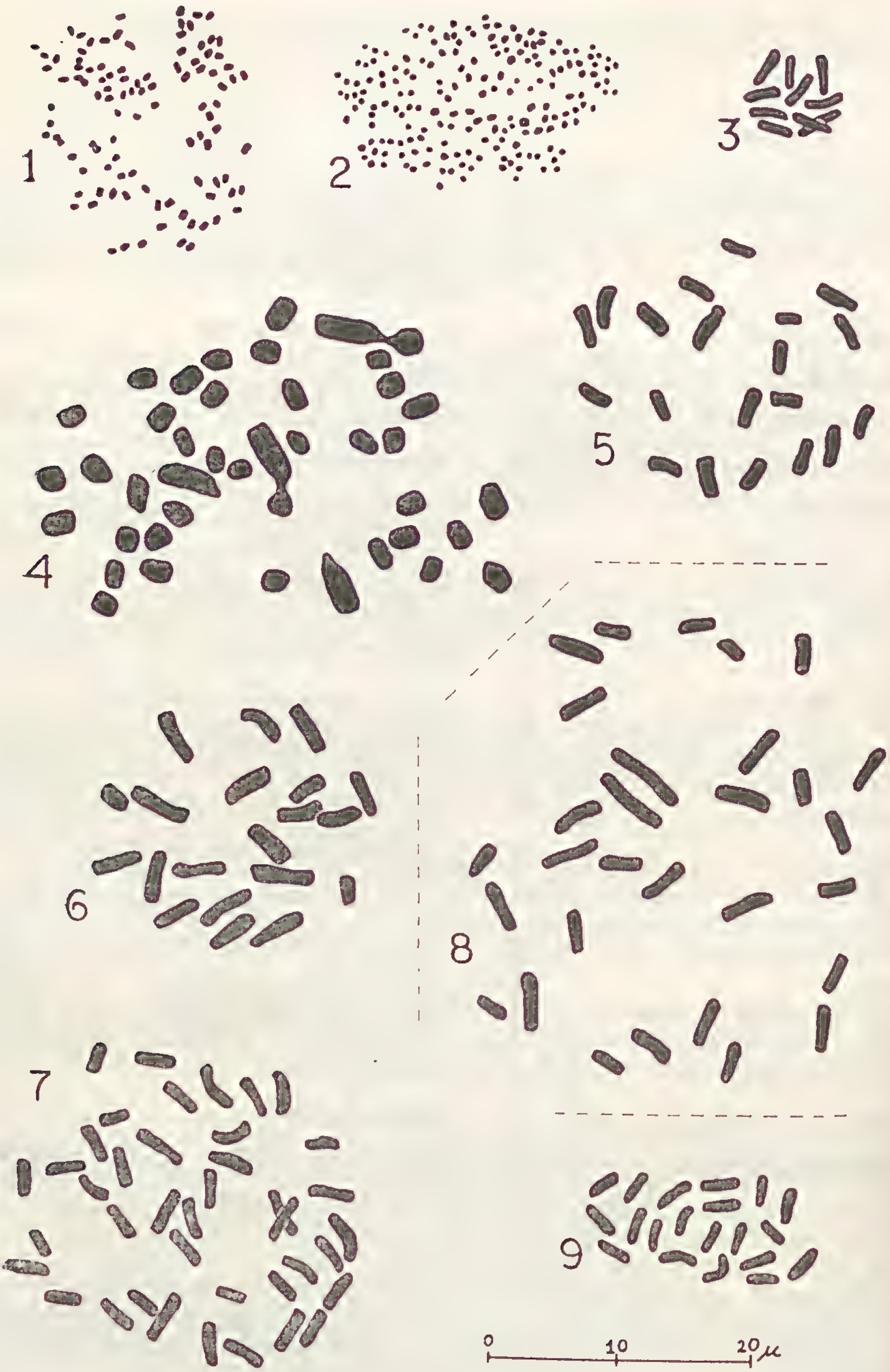

Fig. 1—9 Mitotic chromosomes, captions

1. *Eleocharis sphacelata*, NSW 99495	$2n = 94–100$
2. *E. sphacelata*, NSW 90479	$2n = 176–184$
3. *E. caribaea*, NSW 75445	$2n = 10$
4. *E. pachycarpa*, NSW 89680	$2n = 40$
5. *E. gracilis*, NSW 78806	$2n = 20$
6. *E. acuta*, NSW 100684	$2n = 20$
7. *E. acuta*, NSW 90478	$2n = 40$
8. *E. dietrichiana*, NSW 103082	$2n = 30$
9. *E. cylindrostachys*, NSW 103083	$2n = 20$

High chromosome numbers have been recorded elsewhere in *E. quinqueflora* (Series *Pauciflorae*) and *E. uniglumis* ssp. *sterneri* (*Palustriformes*) but, at least in the latter case (Strandhede 1958), there is little reduction in chromosome size at the higher levels. Very small chromosomes as observed in Series *Mutatae* are apparently not known elsewhere in the genus.

E. pachycarpa is native to Chile and naturalised in the Sydney district. The chromosomes show considerable variation in length (Fig. 4) and one pair has a prominent constriction, not apparently centromeric, a feature not observed in the other species studied.

TABLE II. CHROMOSOME NUMBERS IN *ELEOCHARIS*

See text for explanatory notes

Series	Species	New counts $2n$	Previous Records $2n$
Mutatae	*E. sphacelata* R. Br.	94–100, *c.* 140, *c.* 157, 176–184, *c.* 188.	..
	E. equisetina Presl	*c.* 172	..
Pauciflorae	*E. quinqueflora* (F.X. Hartm.) Schwarz. [*pauciflora*]	..	20, 80, *c.* 100, *c.* 136
	E. parvula (Roem. & Schult.) Link.	..	10
	E. parvula var. *anachaeta* (Torr.) Svens.	..	8
Aciculares	*E. nervata* Svens.	..	10
	E. acicularis (L.) Roem. & Schult.	..	20, 30–38, 50–58, 56
	E. pusilla R. Br.	20, 30	..
	E. atricha R. Br.	20	..
Ovatae	*E. obtusa* (Willd.) Schult.	..	9, 10
	E. engelmannii Steud.	..	10

TABLE II—*continued*

Series	Species	New counts 2*n*	Previous records 2*n*
Maculosae	aff. *E. maculosa* (Vahl) Roem. & Schult.	..	*c.* 25
	E. atropurpurea (Retz.) Kunth ..	..	20
	E. caribaea (Rottb.) S. F. Blake	10	..
	E. minuta Boeck.	20	..
Palustriformes Subser. *Palustres*	*E. palustris* (L.) Roem. & Schult.		
	ssp. *palustris*	..	14, 15, 16, 17
	s. lat.	..	16, 27, 32–42*, 50
	E. mamillata Lindb. f. [*austriaca*]	..	14, 15, 16, 16–18
	E. macrostachya Britt.	..	18, 38
	E. erythropoda Steud. [*calva*] ..	..	18, 19, 20
	E. fallax Weatherby	..	42
	E. ambigens Fern.	..	44, 45, 46
	E. halophila (Fern. & Brack.) Fern. & Brack.	..	37, 38
	E. perlonga Fern. & Brack. ..	..	18
	E. smallii Britt.	..	16
	aff. *E. smallii* Britt.	..	36
	E. uniglumis (Link) Schult.		
	ssp. *uniglumis*	..	46–51*, 54
	ssp. *sterneri* Strandh.	..	74–82, 85, 88
	E. kamtschatica (C. Meyer) Kom.	..	42, 46
Palustriformes Subser. *Truncatae*	*E. tenuis* (Willd.) Schult. [*capitata*†].	..	38
	E. compressa Sulliv.	..	18
	E. montevidensis Kunth. [*arenicola*].	..	10, 20
Tenuissimae	*E. tuberculosa* (Michx.) Roem. & Schult.	..	30
Sulcatae	*E. pachycarpa* Desv.	40	..

* All numbers within the range indicated have been reported. (Where an asterisk is not used a range of numbers gives the limits within which an inexact count has been determined.)

† = *E. capitata* auctt. non R. Br., although recorded as "*E. capitata* (L) R. Br.".

TABLE II—*continued*

Series	Species	New counts 2*n*	Previous Records 2*n*
Multicaules	*E. multicaulis* (Sm.) Sm. . .	. .	20
	E. gracilis R. Br.	20	. .
	E. dietrichiana Boeck.	30	. .
	E. carniolica Koch	. .	20
	E. pellucida Presl [*japonica*] . .	. .	20
Acutae	*E. acuta* R. Br.	20, 40	. .
	E. plana S.T. Blake	40	. .
	E. pallens S.T. Blake	40	. .
	E. cylindrostachys Boeck. . .	20	. .

In Table II the chromosome numbers determined in the present study, together with previously reported counts, are arranged according to the subdivisions of the genus as given by Svenson (1939) with some modifications by Blake (1939). Previous counts are taken from Hicks (1929), Darlington and Wylie (1955), Cave (1958–65), Munz (1959), Löve and Löve (1961), Clapham, Tutin and Warburg (1962), Strandhede (1967), and Ornduff (1967–9). In cases of discrepancy in nomenclature or in the recognition of taxa, the usages of Svenson (1939, 1957) or Strandhede (1967) have usually been adopted. Species names given in parenthesis are regarded as synoynms but were used in previous reports of chromosome numbers. Infraspecific taxa are mentioned only where they differ in chromosome number. There are reports of $2n = 10$ and $2n = 46$ in *E. palustris* s. lat., in addition to the counts listed, but these records probably apply to other species (Lewis and John 1961).

Present information is far from providing a satisfactory chromosomal survey of the genus. There is particular need for further sampling of the *Mutatae*, to determine whether small and numerous chromosomes characterise the whole Series. The intraspecific variation in number in some species of Subseries *Palustres* has been well sampled in several areas but the constancy of euploid and aneuploid numbers in other groups is generally poorly known.

Species with $2n = 10$ are found in five of the ten Series, so the major diversification of the genus must have occurred at a diploid level, followed by the independent development of many polyploid series.

ACKNOWLEDGEMENTS

I wish to thank my colleagues Mr L.A.S. Johnson and Mr O.D. Evans for helpful discussions and for the identification of the material on which this study was based. For assistance in obtaining material I am indebted to Mr E.J. McBarron (Glenfield Veterinary Research Station), Mr M. Gray (Division of Plant Industry, C.S.I.R.O.), Mr H. Brownlee (Department of Agriculture, Sydney), and Mr E.F. Constable and Mr R.G. Coveny (both of the National Herbarium of New South Wales).

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* *Note added in proof:* Chromosome numbers reported by L. J. Harms (Amer. Journ. Bot. LV, 966–974, 1968) for 4 species of Subser. *Palustres* were unfortunately omitted from Table II.

Notes on Australian Taxa of Acacia No. 2

MARY D. TINDALE

SUMMARY

* Three new Australian species of *Acacia* (Family Mimosaceae) are described, namely *A loroloba*, a bipinnate wattle of the *A. decurrens* group (sect. Botryocephaleae) and two phyllodinous taxa, *A. argyraea* (sect. Juliflorae) and *A. wardellii* (sect. Plurinerves). Notes are made on the rarely collected *A. limbata*. *A. maitlandii* is recorded for the first time from New South Wales. An observation is made about the two subspecies of *A. brunioides*.

Acacia loroloba *Tindale* **sp. nov.**

Frutex vel arbor parva effusa usque 4·5–9 m alta, cortice truncorum in arboribus vetustioribus laevi et atro-brunneo, sed in arbusculis rubro vel viridi. Ramuli atro-brunnei, nigri vel atro-ardesiaci, interdum glauci, longitudinaliter (in arbusculis valde) costati, glabri vel ramuli superni pilis appressis griseis vel fulvis ornati. Surculi juniores pallide flavi vel aurei. Folia: petiolus 0·2–2·2 cm longus, in plano verticali applanatus, fere glaber, pilis minutis griseis appressis sparse vestitus, glandula unica sphaerico-depressa sparse pubescenti prope basin paris ultimi pinnarum, interdum etiam glandula inter apicem et basem media ornatus, rhachis 4–8 cm longa, ut petiolus vestita, plerumque cum glandula una ad basin pinnarum paris omnis simul cum glandulis 1–3, saepe minoribus et interdum contiguis, sparse pubescentibus vel glabris, interjugalibus praedita, glandulis rhachidum petiolorumque prominentibus cum orificiis magnis. Pinnae 11–18–jugae, 1·3–3·5 cm longae, 2·2–5 cm latae. Pinnulae 14–30–jugae, 1–2 mm longae, 0·5–0·7 mm latae, coriaceae, atro-virides, non glaucae, sed glabrae et pilis albis vel luteis appressis vel subappressis praesertim subtus instructae, apice late rotundato vel subacuto. Capitula pallide flava, globosa, in racemis vel paniculis disposita, floribus 19–23 in capitulo, pedunculis pilis griseis vel flavis vestitis. Bractea ad basin pedunculi sita deltoidea, pallide brunnea, secus marginem ciliolata. Bracteolae 1·2–1·5 mm longae, pyriformes vel peltatae, sursum dilatatae, petiolo angusto rubro-brunneo ciliolato. Calyx 0·5–1 mm longus, obconicus, breviter quinquelobus, lobis quintam usque octam partem tubi longitudinis aequantibus, angulatus, vel costis glabris vel lobis obtusis et costis pilis albis vel luteis ciliolatis. Corolla 1·5–1·8 mm longa, tubo glabro, quinqueloba, lobis acutis vel subacutis $\frac{2}{3}$ longitudinis tubi aequantibus, pilis paucis albis vel luteis in pagina dispersis, marginibus loborum minutissime granulosis. Stamina numerosa, filamentis circiter 2·5–3 mm longis. Antherae biloculares. Ovarium 0·3–0·8 mm longum, subsessile, praeter paucos pilos albos glabrum, oblongum, apicem versus leviter dilatatum. Stylus lateraliter affixus, glaber, 1·5–2·5 mm longus. Legumina stipitata, coriacea, 7–14 cm longa, 6–9 mm lata, brunnea, rubro-brunnea, atro-brunnea, nigra vel atro-schistacea, plerumque recta vel raro inter nonnulla semina constricta, praesertim margines prominentes versus pilis griseis vel fulvis puberulis appressis vestita. Semina nigra, obscura, in legumine longitudinaliter disposita, anguste oblongo-elliptica, 6–8 mm longa, 3–3·5 mm lata, funiculo fulvo bis breviter plicato, deinde in arillum pileiformem super seminis apicem incrassato, areolo prominente.

Shrub or small tree up to 4·5–9 m high, with a spreading habit, the bark of the trunk smooth and dark brown in older trees but red or green in young plants. *Branchlets* dark brown, black or dark blue, sometimes glaucous, ribbed longitudinally (markedly in young plants), glabrous or clothed with appressed, grey or tawny hairs on the upper branchlets. *Young tips* pale yellow or golden. *Leaves: petiole* 0·2–2·2 cm long, vertically flattened, almost glabrous, sparsely clothed with minute, grey, appressed hairs, bearing 1 spherico-depressed, sparsely pubescent or glabrous gland near the base of the lowest pair of pinnae, occasionally also a gland half-way between the apex and base, the *rhachis* 4–8 cm long, mostly bearing 1 gland at the base of each pair of pinnae as well as 1–3 often slightly smaller, sometimes contiguous, sparsely pubescent or glabrous interjugary glands, the glands of the rhachises and petioles prominent and with large orifices. *Pinnae* 11–18 pairs, 1·3–3·5 cm long, 2·2–5 cm broad. *Pinnules* 14–30 pairs, 1–2 mm long, 0·5–0·7 mm broad, coriaceous, dark green, not glaucous but glabrous or clothed with white or yellow, appressed or subappressed hairs especially on the lower surface, the apex broadly rounded or subacute. *Heads* pale yellow, globular, in racemes or panicles, 19–23 flowers in a head, the peduncles clothed with grey or yellow hairs. *Bract* at the base of the peduncle deltoid, light brown, ciliolate along the margin. *Bracteoles* 1·2–1·5 mm long, with a narrow, red-brown, ciliolate pedicel which is expanded into a pyriform or peltate, ciliolate apical portion. *Calyx* 0·5–1 mm long, obconical, 5-lobed to $\frac{1}{8}$–1/5 of its length, angular, glabrous on the midribs or ciliolate on the obtuse lobes and the midribs with white or yellow hairs. *Corolla* 1·5–1·8 mm long, the tube glabrous, dissected to 2/3 of its length into 5 lobes which are acute or subacute, clothed with a few, white or yellow hairs scattered over the surface, very minutely granular along the margins. *Filaments* of the stamens numerous, about 2·5–3 mm long. *Anthers* bilocular. *Ovary* 0·3–0·8 mm long, subsessile, glabrous except for a few white hairs, oblong, slightly dilated towards the apex. *Style* laterally attached, glabrous, 1·5–2·5 mm long. *Legumes* stalked, coriaceous, 7–14 cm long, 6–9 mm broad, brown, red-brown, dark brown, black or greyish-black, mostly straight-sided or rarely with a few constrictions between the seeds, clothed with grey or fawn, puberulous, appressed hairs especially towards the prominent margins. *Seeds* black, dull, longitudinal in the legumes, oblong-elliptical, 6–8 mm long, 3–3·3 mm broad, the funicles fawn, with 2 short folds, then thickened into a fleshy pileiform aril over the top of the seed, the areole prominent.

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* See Maiden and Betche's classification in A Census of New South Wales Plants (1916) 89–97.

HOLOTYPE: 2 miles S of Kumbia, South Eastern Queensland, bushy shrub 3 to 7 ft high, along the roadside in remnants of dry sclerophyll forest, trunk red or green, smooth between the ridges, M. D. Tindale 10.1960 (NSW 52692), located at the National Herbarium of New South Wales, Sydney, Australia. ISOTYPES: K; US; A; L; MEL.

DISTRIBUTION: Moreton and Darling Downs Districts, South Eastern Queensland.

ECOLOGICAL HABITATS: In dry sclerophyll forest or woodland, in red sandy loams, in red volcanic soils and brown clayey soils, on black soil plains, in undulating country or alluvial flats.

FLOWERING PERIOD: December to late March, sometimes blooming again in July and August.

LENGTH OF LEGUME FORMATION: Probably 9 to 11 months, the legumes maturing in November, but they have been shed by early December.

SPECIMENS EXAMINED: QUEENSLAND: 5 miles S of Durong, on the Condamine-Burnett Highway, tree 20 ft high, in bud with few open flowers, bark smooth and grey, fruit on the ground, growing at the side of the road with *Casuarina luehmannii*, *Eucalyptus crebra* and *E. maculata*, L. Pedley, B. Ledler and M. Tindale 5.12.1968 (NSW 102604; K; US; UC; PERTH); 8 miles NE of Jandowae, on the Burnett-Condamine Highway, tree 15 ft high, with smooth grey bark, fruit on the ground, trees in bud, M. Tindale 5.12.1968 (NSW 102610); 5 miles NE of Jandowae, on the Condamine-Burnett Highway, Darling Downs District, trees 12 ft high in *Eucalyptus crebra-Casuarina luehmannii* woodland, in brown clayey soil, common along roadside, L. Pedley, B. Lebler and M. Tindale 12.1968 (NSW 102563; MEL; K; BRI; L; BH); 8 miles SW of Kumbia, towards Porter's Gap, tree 10 ft high with greenish bark, d.b.h. 4 inches, flowers pale yellow and sweet-scented, common, along roadside, L. Pedley, B. Lebler and M. Tindale 5.12.1968 (NSW 112750; PERTH; K; US; UC; P); 4 miles from Jandowae on Caranga North road, in red soil on roadside, tree to 15 ft (high) branched close to base with widespreading branches, bark smooth, dark brown; flowers pale yellow; young leaves pale yellow to golden, R. W. Johnson No. 420, 3.1958 (BRI 11658; CANB 55329); Darling Downs District, W of Dividing Range, on Bunya Mts.-Cooyar road, a shrub or small tree, L. S. Smith No. 10261, 10.1957 (NSW 34394; BRI; MEL 15504); between Yamsion and Cooyar, small tree 20 ft high,

=4″

diam. at 4′ 3″ on creek bank, Beard No. 931, 10.1957 (NSW 34396); Dalby, Deputy Forester 11.1924 (NSW 20846); ditto, Forest Officer (NSW 20845); Crystal Brook, Bowenville, "this has flowered and flowers again in summer. . . . I've reared a few plants 3 ft high now, one peculiarity is this, at every joint of stem and branch an orange colour appears after a time, did not notice if it disappears in old trees. Colour of stems is purplish. Limbs and branches of these young plants are ribbed longitudinally which extends down the stem but appears to be getting obliterated, as the 3 or 4″ next the ground has lost them. This chooses sandy soil, thriving amongst other timber . . . it is spreading; the open habit maybe 25 to 30 ft high, sometimes spread being equal to height", Fuller 9.1922 (NSW 34394); 14 miles NW of Cooyar on the road towards Yamsion, tree 15 ft high, the bark greyish green and smooth with ridges, flowers pale yellow, in dry sclerophyll forest with eucalypts, *Acacia maidenii*, *Exocarpos*, *Themeda australis* and *Xanthorrhoea*, L. Pedley, B. Lebler and M. Tindale 4.12.1968 (NSW 102609, BRI; K; US; PERTH); Goombungee, Darling Downs, C. T. White 1.1913 (BRI 20844); Toowoomba district, Ward 7.1964 (NSW 74762); Heifer Creek Road, near base of Range on eastern fall of Darling Downs, alluvial flat in sandy loam soil beside road, clump of about 6 trees only, trees about 12 ft high, tips golden, young flower buds, very few pods left on the trees, L. J. Webb and G. Tracey No. 3386, 11.1957 (CANB 63805); Mt. Whitestone, S of Grantham, near roadside, tree to 20 ft high, flowers pale yellow, L. Pedley No. 1146, 12.1962 (CANB 125358; BRI).

A. loroloba is a member of the Botryocephaleae being closely allied to *A. mearnsii* De Wild. and *A. parvipinnula* Tindale, although neither of the latter species is native to Queensland. *A. mearnsii* occurs in New South Wales, Victoria, Tasmania and South Australia, whereas *A. parvipinnula* is restricted to New South Wales. In *A. mearnsii* there are usually 30 to 44 pairs of pinnules in each pinna instead of 14 to 30 pairs as in *A. loroloba*, also the former species is characterized by black, moniliform legumes, whereas in the latter species they are strap-like, brown, red-brown, black, dark brown or greyish black. *A. parvipinnula* is characterized by a silvery trunk, 4 to 12 pairs of pinnae in each leaf and legumes which are bluish-brown or blue-black and more or less constricted between the seeds, whereas in *A. loroloba* the trunk is red or green in young plants and dark brown in older trees and there are 11 to 18 pairs of pinnae in each leaf.

Some collectors have suggested that *A. loroloba* might be a hybrid between *A. deanei* (R.T. Bak.) Welch, Coombs et McGlynn and *A. irrorata* Sieber ex Spreng. ssp. *irrorata* but after extensive field studies I have not found these two last-mentioned species growing together in areas where *A. loroloba* occurs. I consider that the latter is a good species occupying quite an extensive section of the northern Darling Downs and a small area of the Moreton District. The branchlets of *A. loroloba* are slightly tuberculate as in *A. irrorata* ssp. *irrorata* but lack the clusters of stiff hairs on these tubercles.

Acacia wardellii *Tindale*, **sp. nov.**

Acacia binervatae DC. affinis, sed differt: cortice truncorum albo, phyllodiis marginibus summis glandulis 2–4 prominentibus instructis basibusque phyllodiorum magis attenuatis, floribus minoribus, calycibus corollis circiter triplo (nec duplo) brevioribus, leguminibus atro-griseis vel nigris, marginibus prominentibus pallidis, moniliformibus, 5·5–12 cm longis, 4·5–6 mm latis et haud penninerviis, seminibusque funiculo rubro-brunneo ¾ seminis utrinque bis cingenti.

Closely allied to *Acacia binervata* DC. from which it differs in the following ways: the white bark, the phyllodes bearing 2–4 prominent glands on the upper margin and with the bases more attenuated, the flowers smaller, the calyxes shorter being 1/3 of the length of the corollas instead of ½, the legumes dark grey or black, with prominent pale-coloured margins, moniliform, 5·5–12 cm long, 4·5–6 mm broad and never penninerved, and the seeds with a reddish-brown funicle encircling about ¾ of each seed in a double fold.

Slender erect tree or shrub up to 6 m high, the bark of the trunk smooth and white. *Branchlets* angular and ridged towards the apex, very dark grey and glaucous, glabrous. *Phyllodes* coriaceous, slightly to markedly falcate, asymmetrical, 10–17·5 cm long, 1–4·5 cm broad, with 2 prominent veins joining the margin near the base, reticulately penniveined between them, the apex attenuated but obtuse with a hard, erect or curved mucro, with the margins thickened and prominent, bearing 2–4 orbicular glands often occurring on triangular extensions of the lamina, the base oblique, very narrow and elongated, contracted into a pedicel 1–2 cm long, bearing an ovoid gland at its apex, the margin often sinuate. *Heads* yellow, globular, borne in racemes or panicles, composed of 18–26 flowers in a head, the peduncles 3–5 mm long, about 0·1–0·2 mm broad, clothed with short, appressed, yellowish hairs. *Bract* black or dark red-brown, acute, triangular or broadly ovoid, clothed as on the peduncles. *Bracteoles* 0·4–0·6 mm long, red-brown, dilated above, the apical portion peltate or clypeate, densely ciliolate, the pedicel 0·3–0·5 mm long, glabrous or clothed along the margins with white, stiff or crisped hairs. *Calyx* 0·4–0·5 mm long, about a $\frac{1}{3}$ of the length of the corolla, dissected to about 1/5 of its length into 5 obtuse or broadly rounded lobes of which the apical portions are densely ciliolate, the calyx tube glabrous or with a few white hairs on the ridges. *Corolla* 1·2–1·5 cm long, dissected to $\frac{2}{3}$ of its length into 5 subacute elongated petals which are glabrous or with a few white hairs near the apex, the margins papillose. *Stamens* numerous, the filaments 2–3 mm long. *Anthers* bilocular. *Ovary* subsessile, more or less ovoid or oblong, dark brown, 0·5–0·8 mm long, 0·2–0·3 mm broad. *Style* 1·5–3 mm long, fawn, glabrous, borne on one side of the ovary, the stigma not or slightly expanded. *Legumes* stipitate, thinly coriaceous, tuberculate, dark grey or black with a prominent, pale-coloured margin, moniliform, 5·5–12 cm long, 4·5–6 mm broad, not penniveined, almost glabrous, with a few, short, appressed, whitish hairs. *Seeds* black, dull or glossy, longitudinal in the legumes, oblong-elliptical, the funicle reddish-brown, filiform and looped at first, then thickened into a fleshy pileiform aril over the top of the seed and extending about $\frac{3}{4}$ of the distance around the seed, the areole fairly prominent.

HOLOTYPE: Thomby Range, through a divide between the Moonie and Balonne Rivers, south east of Surat, Maranoa District, Queensland, D. M. Gordon No. 3039, 24.5.1955 (NSW 103108), located in the National Herbarium of New South Wales, Sydney, Australia. ISOTYPE: BRI 78919.

DISTRIBUTION: Thomby Range, Maranoa District, *Queensland.*

FLOWERING PERIOD: February to May, also one record for mid-September.

LENGTH OF LEGUME FORMATION: Mature fruit may occur on the trees between September and December.

SPECIMENS EXAMINED: QUEENSLAND: Thomby Range, a very slender erect tree 15 to 20 ft high, with smooth white bark, D. M. Gordon No. 177, 23.11.1953 (NSW 103107); Thomby Range, S of Glenmorgan, J. King 2.1957 (NSW 41158); ditto, J. King 12.1956 (NSW 103110); ditto, D. Gordon 11.1956 (NSW 103111); ditto, flowers lemon-yellow, D. Gordon 21.4.1956 (NSW 39063).

CULTIVATED SPECIMENS: Myall Park, 4 miles NW of Glenmorgan, Queensland, red-brown gravelly loam on low plateau, S. L. Everist 15.9.1957 (BRI 24369); Point Clare, near Gosford, N.S.W., J. King 2.1957 (BRI 32570); Charlestown, near Newcastle, N.S.W., tree 25 ft high, very white trunk and branches, V. A. Wardell 20.2.1957 (NSW 103112). There is also a specimen of *A. wardellii* collected at Condamine, Queensland, by G. Ward in July, 1964, which may be from a cultivated plant.

This species is named in honour of Mr V.A. Wardell who drew my attention to this taxon some years ago but I delayed describing *A. wardellii* until more material was available.

According to Maiden and Betche's classification of the genus *Acacia* in A Census of New South Wales Plants (1916) 94, *A. wardellii* would be classified as a member of sect. Plurinerves undersect. Dimidiatae.

Acacia argyraea *Tindale*, **sp. nov.**

Frutex vel arbor parva, cortice truncorum laevi. Ramuli 2- vel 3-angulati (praesertim apicem versus), pilis appressis sericeis argenteis dense obsiti. Phyllodia anguste elliptica vel elliptica, basi parum inaequilatera, latere distali convexo, latere proximo fere recto, coriacea, 4–8 cm longa, 1·5–3·5 cm lata, nervis principalibus 3–6 prominentibus parallelis, nervis minoribus longitudinalibus, compluribus cum margine abaxiali basin versus confluentibus, venis lateralibus reticulatis sed pilis argenteis sericeis appressis fere obscuris, apice obtuso, mucrone uncinato calloso, glandula unica reniformi 0·3–1 mm supra constrictiones basales distanti sine venae glandula decurrenti nervum versus ornatae. Spicae pallide flavae, axillares, solitariae, floribus 5-meris, secundum axim dense dispositae, pedunculis pilis appressis argenteis dense ornatis, 0·5–1·7 cm longis, 1–1·5 mm latis. Bracteae deltoideae, pilis albis ornatae. Bracteolae 1·2–1·5 mm longae, rufo-brunneae, spathulatae, sursum cymbiformes acutae, villosae, petiolo longo villoso. Calyx cupuliformis, hinnuleus, circiter 1–1·5 mm longus, lobis obtusis quinque 3/5 longitudinis tubi aequantibus, lobis costisque pilis longis argenteis instructis, tubo plus minusve pubescenti. Corolla pallide flava, circiter 1·5–2 mm longa, lobis quinque subacutis dimidium tubum aequantibus, pilis satis longis, erectis, argenteis dense ornatis. Stamina numerosa, filamentis circiter 2–2·5 mm longis. Antherae biloculares. Ovarium subsessile, pallide hinnuleum, circiter 0·8–1·2 mm longum, 0·4–0·6 mm latum, latissime oblongum, pilis argenteis villosis dense ornatum. Stylus pallide hinnuleus, circiter 4 mm longus, modice crassus; stigma non expansum sed stylo fuscius. Legumina basin versus sensim angustata, valvis ligneis, marginibus elevatis pilis rectis patentibus argenteis sericeis vel centrum versus crispis parum patentibus dense ornata, 6·5–8·5 cm longa, 0·8–1·2 cm lata, anguste oblanceolata, apicem obtusum versus dilatata, mucrone brevi uncinato, inter semina non contracta, apicem versus axis dilatati aggregata. Semina immatura brunnea, oblongo-elliptica, in legumine oblique disposita, funiculo crasso arillum cremeum dense amentato super seminis apicem efformante.

Shrub or small shrubby tree with smooth bark. *Branchlets* markedly 2- or 3-angled especially towards the apex, densely clothed with appressed, silky, silvery hairs. *Phyllodes* narrowly elliptical (3: 1) to elliptical (2: 1), slightly obliquely-sided, the upper side convex but the lower almost straight, coriaceous, 4–8 cm long, 1·5–3·5 cm broad, with 3–6 prominent, parallel main veins, the minor veins also longitudinal, several confluent with the abaxial margin near the base, the lateral veins reticulate but almost obscured by silvery, silky, appressed hairs, the apex obtuse, terminating in a hooked callous mucro, the base bearing a tomentose reniform gland just above the constrictions, without a decurrent vein from the gland. *Inflorescences* pale yellow, axillary, solitary, the flowers 5-merous, densely arranged on the axis, the peduncles 0·5–1·7 cm long, 1–1·5 cm broad, densely clothed with silvery appressed hairs. *Bracts* deltoid, clothed with white hairs. *Bracteoles* 1·2–1·5 mm long, red-brown, spathulate, composed of a cymbiform, acute, villous apical portion and an elongated villous pedicel. *Calyx* cupuliform, fawn, about 1–1·5 mm long, dissected to about 3/5 of its length into 5 obtuse lobes, clothed with long silvery hairs on the lobes and ribs, the tube more or less pubescent. *Corolla* pale yellow, about 1·5–2 mm long, dissected into 5 subacute lobes, densely clothed with comparatively long, straight, silvery hairs. *Stamens* numerous, with the filaments about 2–2·5 mm long. *Anthers* bilocular. *Ovary* subsessile, pale fawn, about 0·8–1·2 mm long, 0·4–0·6 mm broad, very broadly oblong, densely clothed with silvery villous hairs. *Style* pale fawn, about 4 mm long, somewhat thick, the stigma not expanded but darker than the style in colour. *Legumes* gradually tapering towards the base, with woody valves, densely clothed with straight, spreading, silvery, silky hairs along the raised margins and crisped, slightly spreading hairs towards the centre, 6·5–8·5 cm long, 0·8–1·2 cm broad, narrowly oblanceolate (6: 1), dilated towards the obtuse apex which has a short hooked mucro, not constricted between the seeds, borne in an erect group towards the apex of an enlarged axis. *Immature seeds* brown, oblong-elliptical, obliquely placed in the legume, the funicle thick and looped on top of each seed into a thickly coiled, cream-coloured aril.

Holotype: Nicholson Station, Western Australia, shrub with smooth bark, C. H. Gittins No. 1393, 7.1967 (NSW 101466). Isotypes: (BRI; K).

Distribution: North Western Australia and the Northern Territory.

Flowering Period: July and August.

Legumes: Mature fruit are borne on the shrubs in July and August at the same time as the flowering spikes occur on the plants. Either the legumes take about 12 months to mature or else there is an earlier flowering.

Specimens Examined: Northern Territory: Borroloola-McArthur River Road, small shrubby tree, C. H. Gittins No. 1335, 7.1968 (NSW ~~112388~~; BRI). 16 Western Australia: Bow River, 4 ft high, spreading, glaucous foliage, pale yellow catkins, F. Lullfitz No. L6198, 29.7.1968 (NSW 112388; K; PERTH); Pentecost River Crossing, in rocky alluvial area, shrub about 3 ft high, N. Byrnes N315, 18.5.1967 (NT 14186).

There is also a specimen collected by Lieut. Dittrich at Corella Lagoon, Upper Georgina River, in August 1886 (NSW 101459). This may be Corella Lake in the Northern Territory.

This species is a member of the Juliflorae, being most closely allied to *Acacia limbata* F. Muell. from which it differs principally in the dense silvery pubescence on the branchlets, phyllodes, inflorescences and legumes. In *A. limbata* these features are completely glabrous. Both species are characterized by angular branchlets, spikes borne on elongated peduncles, more or less elliptical phyllodes with short apical mucros, in addition to erect, woody, oblanceolate legumes with obliquely placed seeds having thickened funicles and arils. However, the legumes of *A. limbata* are abruptly narrowed below the middle, whereas in *A. argyraea* they are straight-sided.

Acacia limbata *F. Muell.* in J. Proc. Linn. Soc. Bot. III (1859) 145; Benth., Fl. Austr. II (1864) 395; Ewart & Davies, Fl. N. Terr. (1917) 323, 349, 351.

Lectotype: North Australia (K), photograph examined. Isotypes: MEL 27242, examined; NSW 103018, examined. The best specimen is at the Herbarium, Royal Botanic Gardens, Kew, so that it has been chosen as the lectotype.

Specimens Examined: Queensland: Gregory-Lawn Hill Road, C. H. Gittins No. 1266, 6.1967 (NSW 84938). Western Australia: 44 miles from Bedford Station towards Tablelands Station, Kimberley, shrub, C. H. Gittins No. 1433, 7.1967 (NSW 101475); Dillon's Springs, East Kimberley, erect shrub 3 to 4 ft high, rocky spots, W. V. Fitzgerald, 10.1906 (NSW 103002).

A. limbata, a member of the Juliflorae, is poorly represented in herbaria, so that it was considered worthwhile to record these collections. This species is characterized by acutely angled, glaucous stems and by almost sessile, falcate, plurinerved, coriaceous phyllodes with the lower veins confluent with the abaxial margin near the base. The spike-like inflorescences are borne on elongated peduncles about 3 to 4 cm long, i.e. about the same length as the spikes or slightly more. In some flowers the tips of the sepals and petals are dotted with orbicular, dark red glands. The legumes are narrowly oblanceolate to oblanceolate, woody, glabrous, glaucous, dark grey, with raised margins, dilated towards the rounded apex with a short, hooked mucro, never constricted between the obliquely placed seeds, tapering abruptly towards the base into a stalk which is often slightly dilated towards the middle; borne in an erect group towards the apex of an enlarged axis. This species is closely related to *A. argyraea* Tindale (see p. 141).

Acacia maitlandii *F. Muell.*, Fragm. Phyt. Aust. III (1862) 46; Eichler, Suppl. Black's Fl. S. Aust. (1965) 174.

This species has been recorded for the first time from New South Wales, a specimen having been collected by Mr W. J. Orme about 10 miles from Gumera Homestead on the Ledknapper Road on the way to Bourke, about 30 miles S of Queensland border, on red sandhills in November 1968 (NSW 103862). *A. maitlandii* is widely distributed on sandy ridges in the Northern Territory, Western Australia, South Australia and Western Queensland. There are several records from Charleville in South Western Queensland as well as a specimen in the Brisbane Herbarium collected by G.P. Althofer No. 45 on the Bollon-Cunnamulla road, Maranoa District, in July 1949.

Acacia brunioides *A. Cunn. ex G. Don*, Gen. Syst. 2 (1832) 404.

In Contrib. N.S.W. Nat. Herb. IV, 2 (1968) 74, I stated that one of the differences between *A. brunioides* ssp. *brunioides* and ssp. *gordonii* Tindale was that the peduncles in the type subspecies were glabrous but pubescent in the other subspecies. However, in some specimens of ssp. *brunioides* the peduncles are sparsely pubescent, e.g. Mt. Maroon, Moreton District, Queensland, L.S. Smith No. 12142, 19.8.1964 (BRI 60118; NSW) and Tooloom Station, N.S.W., W. Dunn No. 338, 22.9.1907 (NSW 103876).

ACKNOWLEDGEMENTS

I wish to thank Mr S.L. Everist, Government Botanist of Queensland, for kindly organizing a field trip for me with Mr L. Pedley and Mrs B. Lebler to study *A. loroloba* in South Eastern Queensland, as well as for providing generous facilities at the Brisbane Herbarium on my two recent visits. My thanks are also due to Mr R.T.M. Pescott, Director of the Royal Botanic Gardens, Melbourne, for allowing me to study certain collections of *Acacia*, and to Dr N.T. Burbidge, Curator of the Herbarium Australiense, C.S.I.R.O., Canberra, for the loan of several photographs of *Acacia* spp. I am very grateful to Mr H.K. Airy Shaw for checking my latin descriptions as well as to Mr A.B. Court, Mr C.H. Gittins, Mr P.S. Green, Mr F. Lullfitz and Mr J.H. Willis for assisting in various ways.

A Taxonomic Study of the Genus *POA* L. in Australia

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SUMMARY

The complexity of taxonomic segregation in the genus *Poa* is discussed with special reference to the Australian populations. Thirty-four native Australian species are recognised and described. New taxa described are: *Poa ensiformis, P. hothamensis, P. clelandii, P. umbricola, P. cheelii, P. helmsii, P. exilis, P. clivicola, P. costiniana, P. gunnii, P. phillipsiana, P. hookeri, P. hiemata, P. fawcettiae, P. crassicaudex, P. rodwayi, P. induta, P. petrophila, P. morrisii, P. mollis, P. labillardieri* var. *acris, P. sieberana* var. *cyanophylla* and *P. sieberana* var. *hirtella.*

INTRODUCTION

Poa L. is a large genus with well over two hundred species occurring especially in temperate to cold climates irrespective of whether the latter results from latitude or altitude. Nearly three thousand combinations in all ranks are listed under *Poa* in Agnes Chase: Index to Grass Species (1962).

In all those parts of the world where the genus is represented, it appears to have presented unusual difficulties to all who have attempted to define its populations in taxonomic terms. The characters by which its members may be differentiated are comparatively few and their nature often inconvenient, while the instability of many characters which might otherwise serve as the basis for differentiation between species does nothing to lighten the task of any taxonomist attempting to render the populations more intelligible. Apomixis and hybridization have been shown to occur in and between many species of *Poa* (see e.g. Stebbins, Variation and Evolution in Plants, 1950, Oxford University Press), and there is little doubt that the problems presented cannot be solved by taxonomic methods alone. Moreover, within the present writer's experience, it is evident that many genotypes possess a degree of plasticity in their morphological responses to environment which exacerbates the difficulties of those who perforce must base their determinations on ordinary herbarium specimens collected at random in many kinds of micro-habitats and at various stages of floral development.

The Australian representatives are no exception to this pattern of variation and instability and their study has presented difficulties unequalled in any other genus of Australian grasses known to me.

There can be no doubt that in theory the survey I have attempted should have been undertaken by a team of workers investigating the genetics, cytology, ecology and taxonomy of the genus. There is scarcely less doubt that such an attack is extremely improbable in the foreseeable future. Workers in the first two fields are so few in Australia that there is little likelihood of even one of them devoting much time to a group presenting many technical inconveniences, such as small chromosomes, and being of such comparatively little direct economic importance. It is, moreover, a moot point as to which should come first, the cytological or the taxonomic study. I am personally convinced that the taxonomic approach should always precede the cytological and then be subject to refinement and correction in the light of findings by the latter discipline. I find it difficult to believe that cytological work on *Poa* spp. in Australia could have made much progress before there had been accomplished some sorting and definition of smaller units than have hitherto been recognised. This in itself has provided one justification for persistence in a study which has admittedly been fraught with endless frustration.

So far no cytological data on Australian species has been presented and no evidence either for or against the occurrence of apomixis amongst them put forward. The difficulties of morphological analysis of the populations, however, does suggest that this may be one factor well worth investigation.

While studying *Poa* I have received much benefit from association with Dr M.E. Phillips who has made an intensive ecological study of the forms occurring in the Snowy Mountains in New South Wales and adjacent lands in Victoria. Without her help in the field and the benefit of numerous collections obtained by herself and her associates I would have found it well nigh impossible to attain any understanding of populations as they occur in the field in the limited time which I have been able to devote to field observation. I am conscious, however, that my own ecological studies have been carried out only over a small area compared with the very large area over which representatives of the genus occur in this country and, though extending into many parts of New South Wales and some parts of north-eastern Victoria and Tasmania, my own field trips have enabled me to observe only a proportion of the populations that are considered in this study. Lack of field experience of populations in other parts of Australia may well have led me into error.

The Snowy Mountains and neighbouring areas of land attaining a high altitude offer an opportunity for altitudinal zonation to a degree unusual in Australia and forms appear to have evolved there which are to be found in few if any other parts of the country. A similar situation may occur amongst the mountains of Tasmania but such areas have not yet received sufficient attention from collectors to enable a clear picture to emerge. Over the greater part of eastern Australia no such high mountains occur and climatic barriers (other than very low rainfall) do not appear to break up the large and variable populations and their distribution is controlled by soil type and aspect rather than altitude. Their individual tussocks must reach astronomical numbers and it is perhaps not surprising that the widespread populations in particular display a bewildering variability.

When, on occasions, this variability has driven me to despair of attaining a basis of classification that might be of some practical use to taxonomists and ecologists, at least I have been greatly encouraged by the conclusions and remarks of other workers who have been confronted with comparable problems in other countries. In particular the remarks of N.L. Bor (The Genus *Poa* in India, Part I, in Journ. Bombay Nat. Hist. Soc. L, No. 4 (1952) 787–838) are so pertinent and, mutatis mutandis, so directly applicable to the situation in Australia that I feel it appropriate to quote many of his comments.

"The systematic treatment of the species of the genus *Poa* is one of the most bewildering and difficult of taxonomic studies. While many species are clear cut and can be recognised at a glance, there are groups of species about which one can only conclude that their evolutionary history has been so complex that they do not lend themselves to systematic treatment by present taxonomic methods. One cannot rely upon a single character to separate species in such groups, but combinations of more or less variable characters must be used—a procedure, it must be confessed, which often leads to the recognition of species by what is suspiciously like guesswork, even if it is termed experience or intuition.

"The foregoing statements do not apply to the Indian species of *Poa* only, but have been the experience of all workers in this field, no matter what flora has been the subject of their studies. One of the reasons for these difficulties is presumably hybridization and polyploidy followed by apomixis. This suggests that the only satisfactory way of dealing with such difficult groups will be by experimental analysis.

"So far no experiments of this kind have been undertaken with any of the Indian species and it seems as if these experiments are far distant. This, however, should not be a valid reason for postponing a revision of the genus in India, for, no matter how difficult and complex the study is or how desirable a knowledge of the genetic basis for each species may be, there are still collections to be named.

"Until all the data necessary to give the complete picture have been obtained, the taxonomist must do the best he can with the material at hand. At any rate we are very far from the stage in our knowledge of the genus *Poa* about which Stebbins (G.L. Stebbins: Variation and Evolution in Plants. 1950. Oxford University Press) surmises 'when this genus is better known, it may have to be regarded as a single huge polyploid complex, which is in part sexual, in part facultatively apomictic, and which contains in addition obligate apomicts'.

"Difficulties of classification in default of breeding experiments and analysis have so far been tackled in adjacent areas (India and Russia) in two ways, neither of which is entirely satisfactory. The first method is to widen the characters of certain species to such an extent that these species become a kind of dustbin to which many of the aberrant or doubtful species can be relegated. . .

"Such a hypothetical species becomes a polymorphic assemblage with extremes looking as different from one another as only two distinct species can. . . .

"The second method is to take a single character as a basis and to divide the species of the genus into two parts on the criterion of its presence or absence, . . . Each of the two divisions so obtained could again be subdivided by taking another character. . . . Further subdivisions would demand other contrasting characters. In this way a rigid dichotomous key is obtained. . . . If the dichotomy in the key is based upon characters which are not absolutely reliable, then the whole system breaks down and makes the determination of species by means of a key impossible. In the absence of data obtained by experimental techniques the writer of this paper feels that an intermediate position between the two extremes is in the circumstances the best course to pursue. By this means the unreasonable expansion of the limits of the species, and hence the inevitable lumping, on the one hand, is avoided, and, on the other, that while due regard is given to the status of recognisable species, excessive splitting on doubtful characters is likewise excluded.

"The procedure however does not solve the question of the treatment of the more difficult groups, and the writer has come to the conclusion that it is quite impossible to deal with the members of such groups by the ordinary classical methods, but that species must be lumped to be dealt with later, when, by breeding experiments the exact relationship of the members of the group can be elucidated.

"Before any key to a genus can be drawn up a decision has to be made regarding the characters to be used for the separation of species. And after the selection of such characters has been made, further consideration must be given to the confidence or weight which can be placed on these characters.

"Such decisions can only be made after experience has been gained by the examination and dissection of a large mass of material. . . . After examination of this very large mass of material, one is forced to the conclusion that, in so far as the genus *Poa* in India is concerned, there is no single character which can be selected (except possibly one) in which absolute reliance can be placed. The degree of reliability also varies. Some characters are almost always present, others fairly constant, while others only occasionally can be found. The one exception to which reference has been made is the possession of scaly rhizomes. . . .

"The compilation of a key to the species of *Poa* is therefore a matter of considerable labour, and the writer has been reduced to a state of extreme exasperation on more than one occasion by the discovery that the carefully built edifice has had to be destroyed, because one specimen of a species did not possess the vital character. The fact of the matter is that groups of characters have to be used, and this method, in a dichotomous key, means the repetition of species in the contrasting sections."

Bor then discusses and evaluates the characters which he has found useful for diagnostic purposes amongst the Indian species. His survey of these is well worth study by any student of the genus. In a later section of this paper the same or analogous characters are discussed in so far as I have found them to be relevant to Australian material.

In the following enumeration of 39 species, Nos 1–11 (and, more dubiously, No. 23) have hitherto been recognised as distinct species and (except for Nos 6 and 23) could be distinguished fairly easily even if some confusion in identification of particular specimens occurred. In Australian literature and practice the remainder have generally been relegated to an amorphous complex to which the name *Poa caespitosa* Forst. f. was until recently applied, and several legitimate names in specific rank were either reduced under it to varietal rank or sunk as synonyms (e.g. by Bentham, Fl. Austral. VII (1878) 650–654 and subsequent authors). More recently some authors and herbarium workers have used the name *Poa australis* R. Br. in the same broad sense.

The name *Poa caespitosa* first occurred only as a *nomen* (and hence is illegitimate) in G. Forster, Prodromus (1786) 89 as entry No. 498. It was applied by Forster to a New Zealand specimen; his plant is not identical or conspecific with any Australian species.

A valid description of Forster's plant as *Poa caespitosa* was supplied by Sprengel, Florae Halensis, Mantissa (1807) 33. The Mantissa was also issued in two parts as theses by two of his students under their own respective names. One of these, by J.F.T. Biehler, which contains the description of *Poa caespitosa*, appeared under the title "Plantarum Novarum ex Herbario Sprengelii Centuriam, speciminis loco inauguralis" and is dated 30th May 1807. It is therefore a debatable though academic question as to whether Sprengel or Biehler should be regarded as the author. Sprengel also supplied a description in a paper entitled "Graminum minus cognitorum, decades duae" published in Mémoires de St. Pétersbourg II (1810) 287–306 (on p. 302 and with t. 8).

However, before these descriptions appeared, *Poa caespitosa* Poir. in Lamarck, Encyclopédie Méthodique V (1804) 73, was validly described, based on a specimen from France. Even though *P. caespitosa* Poir. is regarded as a synonym of *P. nemoralis* L. or is maintained as a race of *P. nemoralis* (as in Rouy, Flore de France XIV (1913) 274) it is apparent that the name *P. caespitosa* G. Forst. ex Spreng. (or ex Biehler) must fall as a later homonym.

The protologue of *Poa australis* R. Br., Prod. (1810) 179, includes the synonym *Arundo poaeformis* Labill. and hence, under the International Code, Brown's name is illegitimate, since the epithet "*poaeformis*" should have been adopted upon transfer to another genus.

Brown also cited specimens from Port Jackson and Tasmania. In the British Museum (Natural History) there are three relevant sheets, all numbered 6290, which bear Robert Brown's handwriting. Two of them are from Port Jackson, one labelled "Poa australis Prod. 179 var. caespitosoides" and the other "P. caespitosoides"; both are specimens of *P. sieberana*. In Brown's manuscripts relating to the Prodromus there is a description under the heading "*Poa caespitosoides*" but he did not publish this name. The third specimen is from Adventure Bay (Tasmania) and appears (judging by a photograph) to be a small plant of *P. poiformis* (Labill.) Druce. In the Herbarium of the Royal Botanic Gardens, Kew, there are two further sheets of Brown's collections numbered 6290; one, from Port Jackson, is *P. sieberana*, the other, from the Kent's Islands in Bass Strait, is *P. poiformis*. Under *P. australis* in Brown's manuscripts reference is made to the Kent's Islands collection. Brown's description in the Prodromus appears to apply best to *P. sieberana*. A collection of Robert Brown's from the Kent Islands in the Melbourne Herbarium is *P. exilis*.

To any worker who may prefer to treat this group in an aggregate sense rather than accept a treatment such as is proposed in this study, I can only intimate that the earliest name available for any component of it is *Poa poiformis* (Labill.) Druce. This choice of name is not otherwise particularly felicitous since, in the strict sense, *P. poiformis* is geographically and morphologically marginal to rather than typical of the aggregate. Bentham did in fact distinguish *P. poiformis* (as "*P. billardieri*") from the complex which he treated under *P. caespitosa* but distinguished it by a character (viz. "Grain adhering to the palea") which I have found to be generally false and hence worthless. Moreover he included *P. laevis* R. Br. as *P. caespitosa* var. *laevis*, although the Type Specimen is conspecific with *P. poiformis*. He also recognised *P. homomalla* Nees (rather uncertainly) and *P. maxwellii* Benth., the latter being based on a specimen now found to be conspecific with *P. serpentum* Nees which he treated as *P. caespitosa* var. *serpentum*. In my opinion these also must be regarded as part of the complex which is, of course, now known to include more forms than were known to Bentham in 1878.

Such an aggregate "species", however difficult to distinguish its components may be, is indeed a veritable "dustbin", and its concept has proved extremely unsatisfactory to both field workers and herbarium botanists in the past. Its concept involves the lumping of forms as extreme, for instance, as those shown in Plates IX and X, and provides no help to the ecologist who finds that a number of forms, each comprising substantial populations, occupy separate ecological niches in his area of study.

These differing populations have every appearance of having a substantial degree of reality in the field, and the degree of variability exhibited by the more detailed or minute characters, which might otherwise be of more incisive usefulness to the taxonomist, must simply be accepted as inherent in the nature of the genus.

That the different appearance of these forms in the field is due to genetic characters, and cannot be explained away on the assumption that it is due to morphological responses to the different conditions of the habitat, has been amply demonstrated by Dr M.E. Phillips who, while an officer of the Snowy Mountains Hydro-Electric Authority, cultured clones of numerous wild tussocks in its nursery and experimental garden at Cooma. She found that, although under the experimental conditions of frequent watering and virtual freedom from competition, all forms appeared more vigorous and perhaps a little coarser than was usual in the field, each maintained the same relative differences to the others. From personal observations of her cultures during several visits to Cooma and close examination of the many specimens she procured from them, I would confirm her observations.

Nevertheless the complete discontinuity between populations that is ideally regarded as necessary for their recognition in the category of species cannot confidently be claimed. Despairingly one must concede that intermediates must be expected.

The problem then arises as to whether the segregates should indeed be treated as species or in infraspecific rank. In the present treatment adoption of the latter course would involve trinomial nomenclature for some 27 forms, with some of them further subdivided.

Rather than adopt such a cumbersome system I have preferred to give way to considerations of convenience and accord specific rank to the majority of the forms which some years of work have enabled me, generally, to recognise; I entertain the hope that such treatment will prove also of convenience in any attack upon the genus from other disciplines which might add to knowledge of its biology.

In the course of my protracted, if intermittent, study of the genus over the last 16 years I have examined very many hundreds of specimens. Constructive criticism of my findings will be very warmly welcomed from any botanist with similar experience.

I am deeply grateful to the Directors and Staff of the Royal Botanic Gardens, Kew; the Queensland Herbarium, Brisbane; the National Herbarium of Victoria, Melbourne; the State Herbarium, Adelaide; the Waite Institute, Adelaide; the Western Australia Herbarium, Perth; the Botany Departments of the Universities of Sydney, Tasmania, Adelaide and the Australian National University, Canberra; the C.S.I.R.O., Canberra; and the Snowy Mountains Hydro-Electric Authority, Cooma, for their kindness and patience in allowing me to examine their collections and to retain them for study for periods far in excess of that normally accepted as being within the bounds of inter-herbarium courtesy.

Similar thanks are due to a number of individuals, especially Sir John Cleland of Adelaide, Mr L.D. Williams of Meningie, South Australia, Mr A.C. Beauglehole of Gorae West, Victoria, Dr M.E. Phillips of Canberra, and Mr C.K. Ingram of Sydney. Many collectors have been helpful in providing specimens.

The following overseas herbaria have been generous in lending (or sending photographs of) Type Specimens of particular species, or in making searches for them in their collections: the British Museum (Natural History); the Botany School, University of Cambridge, England; the Komarov Botanical Institute of the Academy of Sciences of the U.S.S.R., Leningrad; Herbarium, Universitatis Florentinae, Istituto Botanico, Florence; Muséum National d'Histoire Naturelle, Paris; Conservatoire et Jardin Botaniques, Geneva; Botaniska Avdelningen Naturhistoriska Rijksmuseet, Stockholm; the Rijksherbarium, Leiden; the Naturhistorisches Museum, Vienna; Botanisches Institut der Universität, Frankfurt am Main, Germany; Botanisches Institut der Universität, Kiel, Germany; Systematisch-Geobotanisches Institut, Universität Göttingen, Germany.

I would gratefully acknowledge the facilities granted to me by the Snowy Mountains Hydro-Electric Authority during several visits to Snowy Mountains areas.

Several valuable pieces of information were kindly conveyed to me by Dr C.E. Hubbard of the Royal Botanic Gardens, Kew.

I am indebted to my colleagues, Dr Barbara Briggs, for the microphotographs reproduced in Plates XI and XII, as well as to Dr Mary Tindale and Mr L.A.S. Johnson for kindly checking my Latin descriptions.

Dr Bacskai of the University of Melbourne very kindly sectioned the leaves of a number of specimens, which I had collected and fixed, and forwarded microphotographs of his preparations. His results opened an interesting field which, unfortunately, I have not had the opportunity to pursue during the present investigation.

My special thanks are due to Dr M.E. Phillips for her guidance through many complexities of the genus as displayed in the field, generous sharing of the knowledge that could be obtained from her experimental cultivation of clones, and persistent encouragement during the early phases of this study when it often seemed that taxonomic segregation and enumeration of the forms was a hopeless task.

SPECIES EXCLUDENDAE

I have excluded from the present study all those combinations under *Poa* in which the species is described as having a 3-nerved lemma. Most of these will be traceable in the genus *Eragrostis*. Combinations relating to species now known to be referable to the genera *Deyeuxia, Distichlis, Dryopoa, Festuca, Glyceria* or *Puccinellia* have likewise been excluded.

HERBARIUM ABBREVIATIONS

The location of each specimen cited in the following enumeration of species is indicated by the standard abbreviations listed for each institution in Index Herbariorum, Part I. The Herbaria of the World, Regnum Vegetabile vol. 31 (1964). In addition the following abbreviations have been used in this paper:

ACB	the herbarium of A.C. Beauglehole.
ANU	the herbarium of the Australian National University, Canberra.
EJMcB	the herbarium of E.J. McBarron.
JBC	the herbarium of J.B. Cleland.
LDW	the herbarium of L.D. Williams.
KI	the herbarium of K. Ingram.
NAW	the herbarium of N.A. Wakefield.
UNSW	the herbarium of the University of New South Wales, Kensington.

EVALUATION OF CHARACTERS

Life Cycle. *Poa* contains both annual and perennial species. There is only one native Australian annual, *P. fax*, and one naturalised annual, *P. annua*. The latter has been reported in some countries to have a perennial variant; in Australia it sometimes persists in favourable situations beyond its normal season of growth but I have found no reason to regard it as being morphologically or biologically other than an annual.

Rootstock and Shoots. The majority of the Australian species of *Poa* are tussock-forming and the shoots arise from an extremely contracted or vertical rootstock. In a few species rhizomes or stolons are developed, and tufts or fascicles of shoots develop at their nodes.

The naturalised *P. pratensis* has a well developed rhizome system, and hence good turf-forming potentialities, that is unmatched amongst native Australian species, but a more sparse production of rhizomes is clearly evident, for example, in *P. drummondiana*, *P. fordeana*, *P. ensiformis*, *P. hothamensis*, *P. cheelii*, *P. homomalla*, *P. compressa* and *P. halmaturina*. This results in the development of new fascicles of shoots somewhat remote from the parent tussock (see Plate IX, 1), though further growth of lateral rhizomes and their shoots may result in amalgamation into what appears to be a single large tussock. All too frequently these underground organs are inadequately represented in herbarium specimens. When gathered by pulling from the ground the rhizomes generally fracture and are left behind often unsuspected; collectors should first loosen the soil and ensure that the rootstock is obtained intact. In *P. cheelii* the rhizome is closely scaly; in the absence of this organ there is no certain means of discriminating between this species and the tussocky *P. labillardieri*, though the habitat in which the plant is growing may provide a pointer.

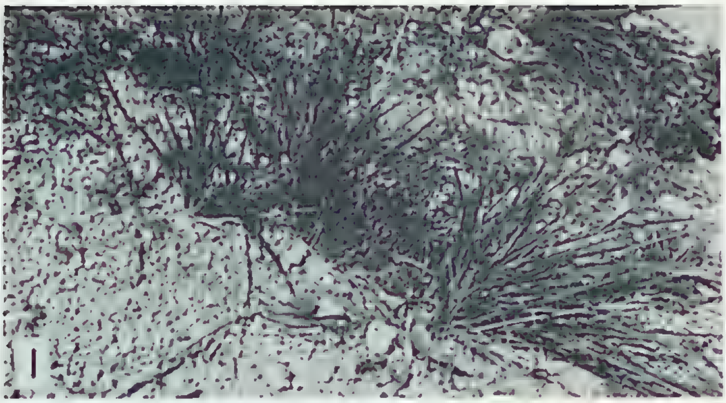
Stoloniferous shoots are often produced in such taxa as *P. tenera*, *P. affinis*, *P. umbricola* and *P. sieberana* var. *cyanophylla*. These stolons are by no means distinctive-looking organs. Fascicles of shoots tend to arise here and there at a node on some of the shoots which then bend over with their own weight or are forced over by the pressure of expansion from the rest of the tussock. If contact with the ground results, roots may be produced from the lower surface of the same node and a new tussock become established.

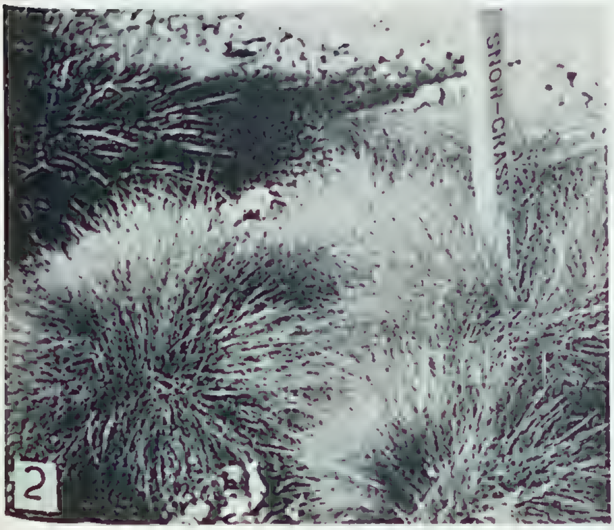
Definition of the three growth forms as caespitose, rhizomatous or stoloniferous is easy; discrimination between them on herbarium specimens may be a great deal less so. Apart from the previously mentioned deficiencies in collecting, it has appeared to me that many caespitose species retain a facultative ability to develop a short rhizome or stolon on rare occasions as an adaptive response to unusual conditions, such as a fortuitous change of soil level, although their populations as a whole do not do so under normal circumstances. Conversely a potentially rhizomatous or stoloniferous species may not under all habitat conditions nor at all growth stages necessarily display this character. Nevertheless the nature of the rootstock has proved a very valuable character in the present attempt to elucidate the species.

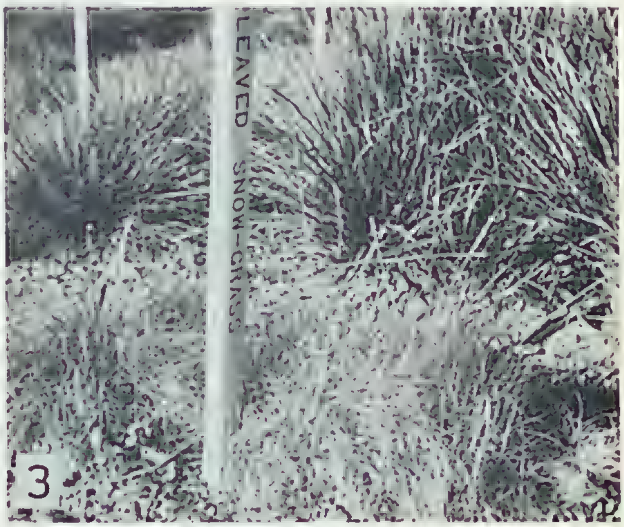
In *Poa* shoots may be intravaginal or extravaginal, and some species develop a combination of both. Rhizomes naturally develop from extravaginal buds; in some species extravaginal buds are of rather frequent occurrence but lateral displacement of the resultant shoot is so slight that description of the rootstock as a rhizome would scarcely seem appropriate. Species with extravaginal buds also usually produce numerous intravaginal shoots in fascicles. Most of the densely caespitose species increase by intravaginal buds almost exclusively but it would be rash to suggest that they could not facultatively produce an occasional extravaginal shoot. *P. sieberana* var. *sieberana* is usually intravaginal but in *P. sieberana* var. *hirtella* (in general of more westerly distribution in eastern Australia) extravaginal shoots are not infrequently produced. The aerial shoots of stoloniferous species may similarly be extravaginal or intravaginal, in the former case a fascicle of intravaginal shoots then developing above an extravaginal shoot.

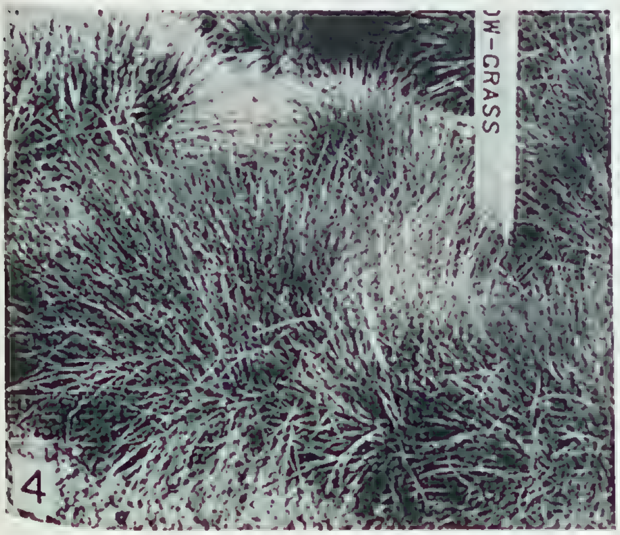
An extravaginal shoot can be recognised by the presence at its base of one or more cataphylls, i.e. reduced leaves or scales consisting of a modified leaf sheath devoid of ligule or blade and generally rounded at the apex. Sited at or below ground level, these scales are subject to early decay once their protective function has been accomplished and they become increasingly fragile. In consequence they can all too easily be shaken or rubbed away with the soil by the diligent collector; on the other hand if not so shaken they will be effectively masked by clinging soil or debris. Despite these inconveniences a close look at the base of a specimen for evidence of extravaginal shoot production is always worthwhile. Care must be taken to avoid confusing a true cataphyll (which never has a leaf blade or at most has a minute vestige thereof) with a normal leaf-sheath from which the blade has fallen away.

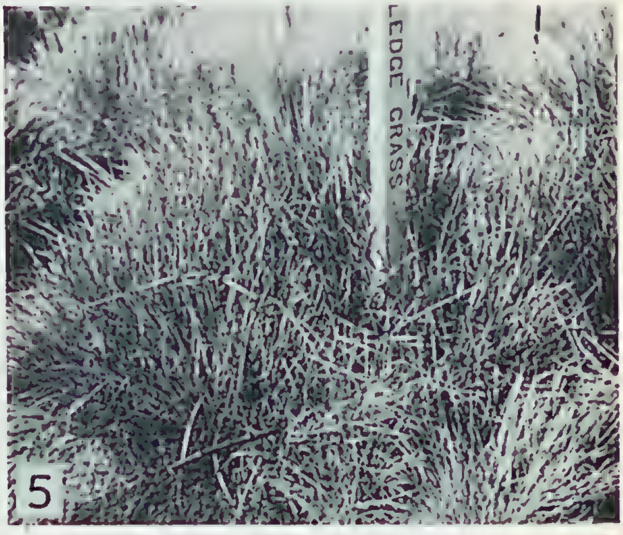
Plate IX.











1. *Poa ensiformis*, showing fascicles of shoots arising from an underground rhizome. 2–5. Clones of *Poa* spp. cultivated in S.M.H.E.A. nursery at Cooma. 2. *Poa sieberana* var. *cyanophylla* 3. *Poa hiemata* (in foreground) and *Poa helmsii* (in background). 4. *Poa costiniana*. 5. *Poa hothamensis*.

Plate X.

Clones of *Poa* spp. cultivated in S.M.H.E.A. nursery at Cooma. 1. *Poa sieberana* var. *sieberana*.
2 *Poa labillardieri* 3 *Poa ensiformis*

In intravaginal shoots the first leaf is a rather delicate, elongate, 2-keeled prophyll placed opposite to the subtending sheath and usually to be seen only upon careful dissection of the young shoot.

In the descriptions of species in this paper, attention is drawn to the extravaginal character in the species in which cataphylls have been noted in a good proportion of the specimens examined which include good samples of the rootstock. It is obvious that specimens consisting of a single culm or single fascicle of shoots (or few of them) may completely fail to display this quite valuable clue to their identity; collectors, and others who break up tussocks into individual herbarium specimens, are urged to preserve in each a generous sample of rootstock and foliage.

At high altitudes on acid soils the leafage of previous season's growth tends to accumulate as debris rather than to become humified and the resultant substratum to become more or less peaty. Over a period of years the new growth of shoot fascicles tends to form at higher and higher levels on the old shoots in strictly caespitose species, leading to the development of what might be termed a vertical or oblique branching rhizome, the roots still remaining chiefly at the base, though occasional rooting may occur at higher nodes when conditions of the substratum are favourable. Through this process the existing season's growth may be connected with a distant root system by elongate stems which are usually slender and fragile. It is for this reason that the tussocks are very susceptible to degeneration through trampling by man or beast and are easily destroyed or degraded by the wheels of vehicles.

Culm. In the majority of Australian species the culm is rounded or broadly oval in cross section; occasional flattening due to sideways compression in a dense tussock may occur but does not materially affect the generality. In *P. homomalla*, however, the culm is markedly compressed and two-edged; this is a feature also of the naturalised *P. compressa* and, to a considerable extent, of *P. fordeana*.

In *P. drummondiana* the lowest few internodes may be swollen into globular or shortly ovoid nodules, although these do not appear in every herbarium specimen. A similar but less obvious tendency to develop more slender and elongate nodules has been noticed in some specimens of *P. crassicaudex*. The conditions under which these occur and their frequency and significance are worthy of further study in the field.

The culms may be smooth or somewhat scabrous especially just below the panicle but so much variability may occur within a species that this has not been found a particularly useful character for discrimination amongst the species with which this study is concerned.

Sheaths. In *Poa* the sheaths are generally open with overlapping margins, often becoming loose from the culm upwards. Indeed the open sheath has been frequently used as one of the characters distinguishing *Poa* from *Glyceria*. In *Poa homomalla*, however, the sheaths are fused around the culm almost to the orifice but this species does not share other characters of *Glyceria*. In *P. drummondiana* and *P. fordeana* also the sheaths are closed towards the base and open above.

Sheaths may be smooth, more often scabrous, or variously pubescent with short or long hairs. The tomentum provides fairly useful characters in differentiating between some species though it is subject to an inconvenient degree of variability.

The colour of the lower leaf-sheaths has proved of practical value, though it might appear theoretically trivial and is possibly subject to variation due to such habitat conditions as insolation. In some species a purplish tinge is very common (though not invariable) whereas in others it is rarely if ever developed. In species which develop this purplish colouration it seems to occur most regularly in tussocks which are exposed to strong sunlight and particularly towards the margins of the tussocks; in more shaded shoots it may be suppressed. Colouration of the upper culm sheaths is highly variable and has not been found to provide any useful character.

The length of the lower sheaths is too variable to be used as a key character, but the generally long lower sheaths of the larger species such as *P. labillardieri* and *P. helmsii* are noticeable in many specimens.

In the naturalised *P. bulbosa* the lower leaf-sheaths may become thickened and succulent forming elongate-conical or pear-shaped bulbs which are capable of serving as vegetative propagules. Development of these bulbs has been noticed chiefly on plants growing on sandy soils of the dry interior.

Ligule. The ligule provides useful characters for discrimination between species of *Poa*. It may be membranous and in that case from truncate to acuminate in shape, or reduced and minutely ciliolate, the membranous portion sometimes reduced to virtual obsolescence. In species with thinly membranous ligules, the ligule is usually smooth on the back, while in those with a more firmly membranous ligule it is often minutely scabrid or puberulous.

Blades. The blades may be more or less flat or broadly V-shaped in cross section, or rolled with overlapping or somewhat inrolled margins. In many species they are linear and at the apex taper rather abruptly into a keeled and hooded tip resembling the prow of a boat; this feature of the apex is more noticeable in the broader- and flatter-leafed species and may be somewhat masked by the over-all slenderness and rolled character of the fine-leafed species which sometimes appear to taper more gradually towards the narrowly and shortly abrupt apex. In a few species with flat leaves also, such as *P. queenslandica*, the blades taper quite markedly upwards.

The width and flatness or otherwise of the blades provide important discriminatory characters, but allowance must be made for the effects of habitat and drying processes; even comparatively broad-leafed species may produce narrower leaves under harsh conditions and tend to roll on drying either during their life cycle or, when collected, if not promptly pressed flat.

The blades are rather thin, herbaceous and flaccid in such species as *P. annua*, *P. fax*, *P. bulbosa* and usually *P. tenera*, firmly herbaceous in *P. pratensis*, and variously firm to almost rigid in the majority of Australian species. The word "rigid" must not be interpreted too literally; it has been used in this paper to describe a greater than usual resistance to bending. On specimens comprised of a few leaves only it is often difficult to assess; but on whole tussocks differences of rigidity may be quite noticeable and it can be recorded that the rigid-leafed species provide a far less comfortable seat for the field worker to picnic upon than do the less rigid.

The colour of the fresh growing leaves often provides a valuable field character, but this is not always well preserved in dried specimens. Thus *P. annua* is characteristically light, almost yellowish-green in colour, *P. pratensis* a much darker green, while *P. phillipsiana* and *P. fawcettiae* in particular are often bluish-green and *P. petrophila* a somewhat tawny-green. The light green of *P. helmsii* is noticeably different from the darker and duller green of *P. ensiformis*. However, during winter or even after drying out somewhat in summer the tussocks so often assume an over-all greyish or brownish-grey appearance that the value of the colour character is lost. Some variation of colour even within the species must be expected; at times this may be due to the micro-habitat conditions but otherwise can only be accepted as a variability inherent in the genus. Considerable variation in colour is often seen in the widespread *P. sieberana*, sometimes between whole local populations which are otherwise quite indistinguishable; for instance its population on the Blue Mountains of New South Wales is often noticeably glaucous-green.

The vestiture of the blades is regarded as providing characters of importance, though subject to an inconvenient degree of variability. The blades may be quite glabrous and virtually smooth (though sometimes even then minutely scabrid at the tip and margins), or finely to coarsely scabrous, or provided loosely or densely with short or long hairs or both intermingled (see Plates XI and XII). I have found that a sensitive test for the smoothness or scabridity of the blades is to pass them gently in each direction between the lips.

Floral Characters. Amongst the native Australian species there are perhaps four which can be readily recognised from their floral characters alone, viz. *P. fax*, *P. drummondiana*, *P. saxicola* and *P. queenslandica*. The remainder form a complex with such a high degree of similarity and overlapping of floral characters that, perforce, key characters have had to be drawn heavily from their vegetative features.

Inflorescence. The spikelets are arranged in a panicle which is contracted and narrow with short erect branches in *P. fax* and *P. saxicola* but in the majority of Australian species, after complete emergence from the boot, is more or less pyramidal with effuse wide-spreading branches. The spikelets are borne towards the distal ends of the branches leaving the lower portions bare. The panicles of *P. annua* and *P. pratensis* are a little more compact with relatively shorter branches than those of the native species.

Bor (The Genus *Poa* in India, Part I, in Journ. Bombay Nat. Hist. Soc. L (1952) 287–838) found that among Indian species the number of panicle branches in the lowest pseudo-whorl provided a significant character. Amongst the Australian species I have found the number to be so variable, e.g. within limits of about 1 to 7, apparently being greatly affected by vigour resultant upon climatic and habitat factors especially at flowering time, that I have felt it to be of little value as a key character.

If it were possible for a statistical analysis to be made of the length and breadth of all inflorescences, I feel sure that significant differences between certain species would emerge. However, the herbarium taxonomist is confronted not with statistical averages but with the problem of identifying a particular specimen which may or not approach the average for its species. For this reason little attempt has been made to utilise actual dimensions as a key character, and the less satisfactory method of describing panicles as large or small has had to be adopted to provide at least a clue to the field worker who generally has a whole population under observation at the one time.

The length of the pedicels is similarly very variable within limits, but a tendency for the pedicels to be, on the average, rather short, accounts for the rather dense, contracted inflorescence which is usually, though not invariably, produced by the coastal *P. poiformis*.

Similarly various other features of the inflorescence have proved intractable to define in precise terms and applicable to all stages of development, but the field observer will often be impressed by the more dainty appearance of the inflorescence in some species than in others and recognise it as a helpful, if not completely reliable, guide towards a conclusion as to its identity.

Spikelets. The spikelets are always laterally compressed in *Poa*, in most Australian species very strongly so, resulting in their being strongly flattened and 2-edged at least at and after anthesis. However in *P. drummondiana* and *P. saxicola* the compression is comparatively slight and the spikelets noticeably plump. On a much less conspicuous scale the spikelets of *P. pratensis* also are a little more plump than in any of the Australian species with which it might otherwise be confused.

The spikelets contain 3 to 8 florets, rarely more, and commonly 5, the lemmas gradually diminishing in size upwards and the uppermost generally being reduced and infertile. Within limits the actual number of florets has been found so variable in each species, and even on a single specimen, that no reliance can be placed upon number as a diagnostic character. When dimensions of the lemma are given in the following descriptions these should be taken as applying to the lowest one or two florets.

Prior to anthesis the spikelets are oblong or ovate, but at anthesis and later they are usually oblong, cuneate or oblong-cuneate. Apart from the two with very plump spikelets, shape as such has not proved of much value in discrimination between the Australian species.

Colour of the spikelets has proved of little value. Those developing in shade are often green, those in bright sunlight are often variously tinged with purple. Occasional aberrant individuals with panicles of very yellowish spikelets have been found in some species, e.g. *P. fawcettiae*, *P. hiemata* and *P. costiniana*, but this has not appeared to be of any taxonomic significance. Purplish tinting rarely occurs in *P. annua* or *P. pratensis*. In all species the spikelet colour fades to straw-colour at maturity.

At maturity the spikelets break up beneath each lemma leaving the glumes persistent on the pedicels.

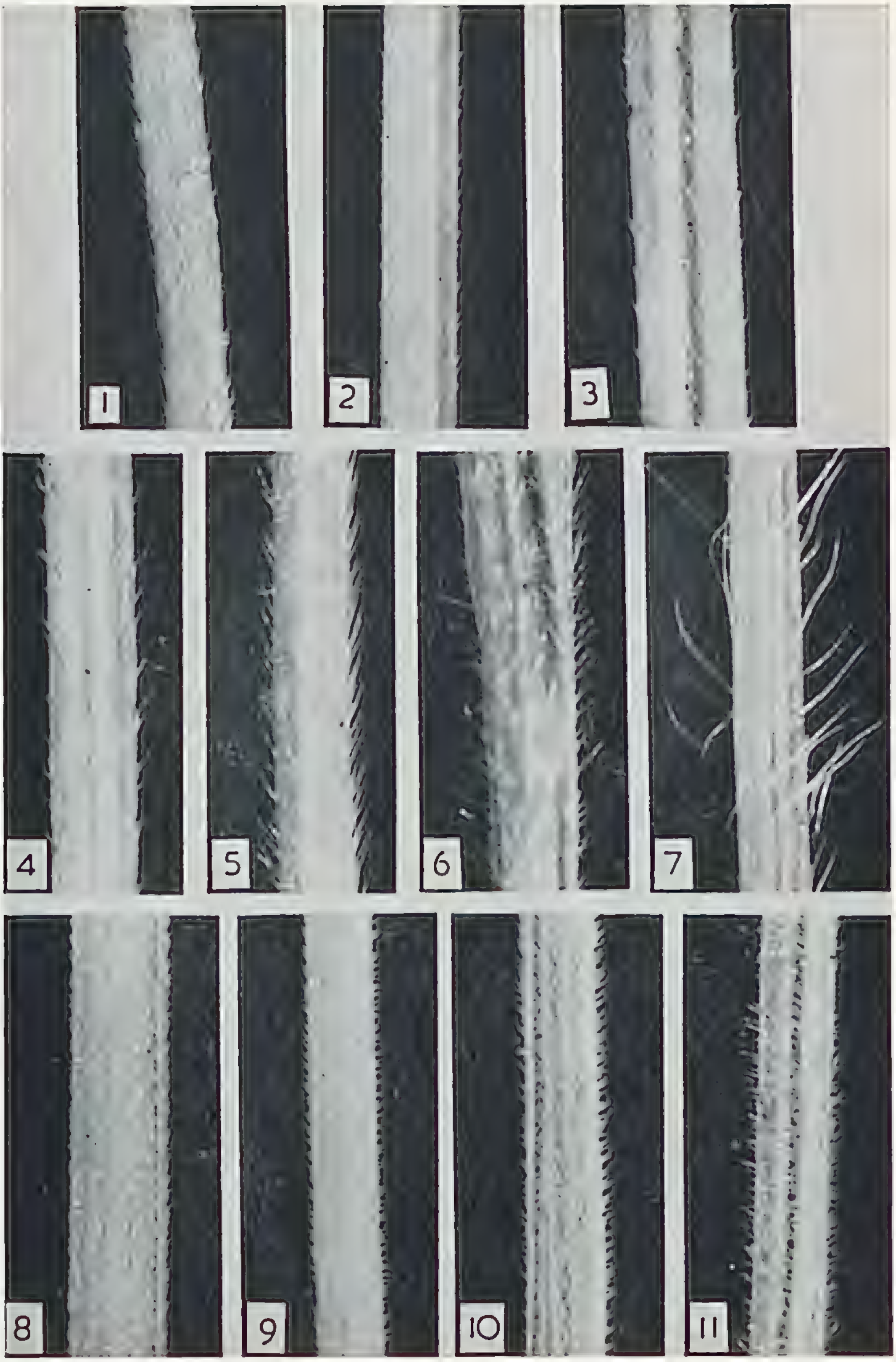
The spikelets are so small that examination of their parts as described below requires a reasonably high magnification, e.g. from 10× to 40× for the various parts.

Glumes. The glumes are unequal with the lower a little shorter and narrower and 1- to 3-nerved; the upper is 3-nerved. Both are keeled especially upwards and commonly a little scabrous upwards on the keel and sometimes on the sides especially towards the apex. Usually they are narrowly hyaline on the margins.

Their shape and length relative to the length of the lowest two lemmas should always be noted, but again it must be observed that while the statistical averages would probably show a significant difference between species or groups of species, their variability is too great to rely over much upon this character when identifying particular specimens. In general terms it may be stated that the glumes of *P. labillardieri*, for instance, tend to be longer and proportionately narrower than those of *P. sieberana*, but some specimen or other will invariably conflict with this statement.

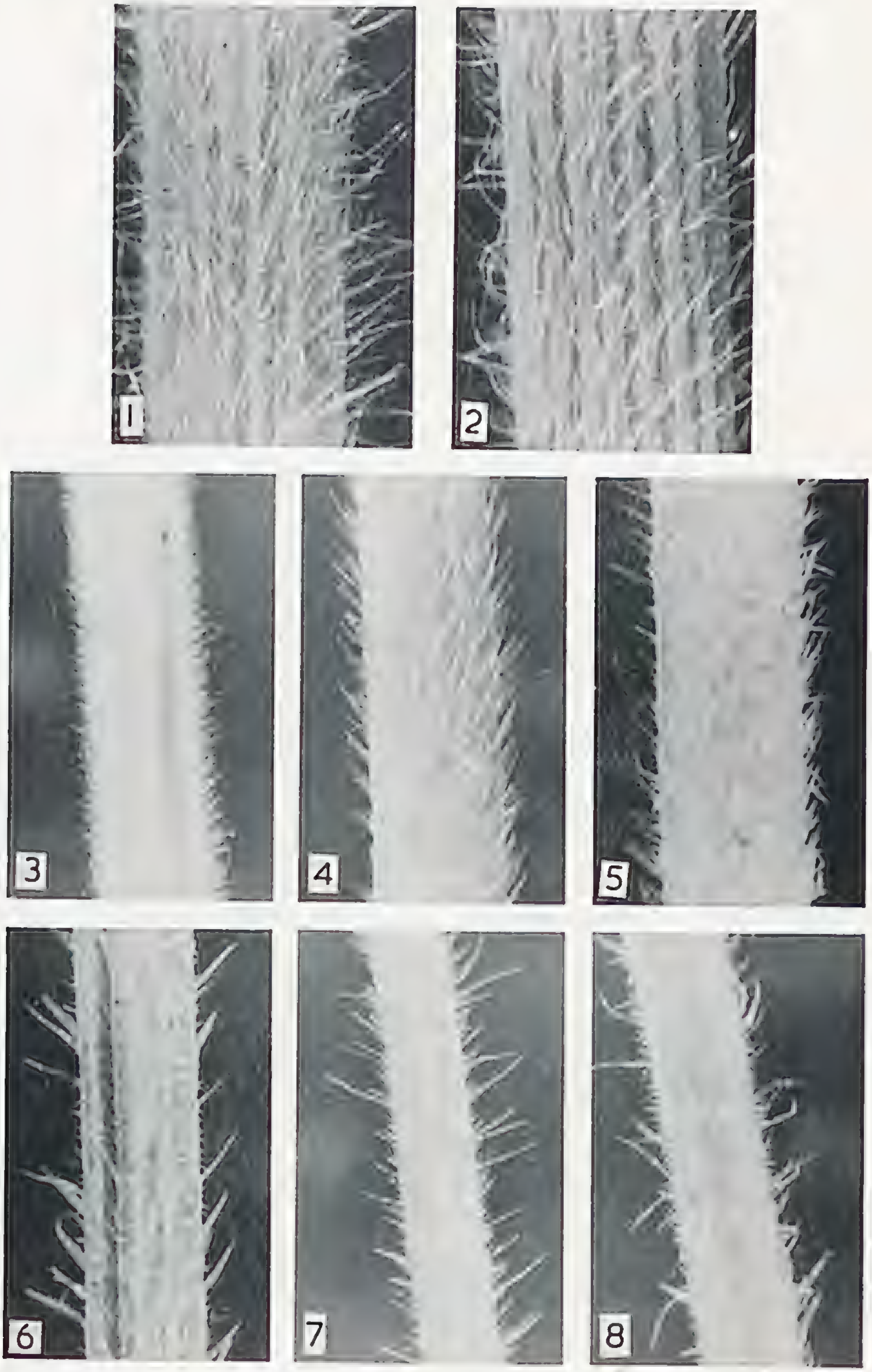
Rhachilla. The rhachilla in the genus *Poa* is slender, terete and jointed below each floret. Each internode is attached to the base of the adjacent lemma and falls together with it when the florets break apart. The rhachilla is prolonged above the uppermost perfect floret and crowned with a variously reduced rudimentary floret. It is generally smooth and glabrous but occasionally may bear a few hairs; the latter, however, do not appear to be of any discriminatory value amongst the Australian species.

Plate XI.



Vestiture on leaf-blades of *Poa* spp. 1–2. *Poa sieberana* var. *sieberana*; blades scabrous. 3. *Poa crassicaudex*; a scabrous blade (in this species the blades may also be scabrous-pubescent or pubescent). 4–7. *Poa sieberana* var. *hirtella*; blades stiffly hirsute with short to long, often distant hairs. 8–11. *Poa rodwayi*; blades from finely and densely scabrous to finely, densely and shortly pubescent. × 25.

Plate XII.



Vestiture on leaf-blades of *Poa* spp. 1–2. *Poa morrisii*; blades softly and more or less densely pubescent with long hairs. 3. *Poa mollis*; blades shortly, finely, softly and densely pubescent. 4–5. *Poa petrophila*; blades densely pubescent with hairs of even length. 6–8. *Poa induta*; blades pubescent with intermingled long and short hairs. × 25.

Callus and Web. The callus at the base of each floret is very short and blunt and is notable chiefly for bearing, in many species, a number of long crinkled hairs which form what has been variously termed the web or wool. At first these hairs are tightly folded at the foot of the lemma but at maturity they become extended in cobweb-like fashion and have a similar tendency to cling to any object with which they come in contact, an attribute which is doubtless of value in seed dispersal. For this reason the term "web" has been adopted in this study. In some species the web is copiously developed, as in the great majority of the specimens examined of *P. poiformis* and *P. labillardieri*. In some others it is less regularly or well developed, as in *P. sieberana*. In a few, e.g. *P. serpentum*, it is absent. Thus the web provides a useful but not always completely reliable, diagnostic character.

Lemma. The lemmas are always keeled at least upwards, though at the base they may appear more gently rounded, and 5-nerved (or up to 11-nerved in *P. fax*). They are herbaceous in texture in *P. annua*, *P. pratensis* and *P. bulbosa* and often also in *P. tenera*, but in most Australian species they become very thinly indurated at maturity even if somewhat herbaceous while young. Their surface is dull and mat and, in the native species, granulated due to the presence of numerous silica cells, and occasionally slightly scabrous upwards. The granulations are often particularly noticeable in *P. poiformis* but as this is only a matter of degree and somewhat variable, it scarcely supplies any useful key character.

The lemmas are noticeably broad in *P. saxicola* and *P. drummondiana*, but the majority of the species treated here have lemmas which display such intraspecific variability and such interspecific similarity that attempts to use fine detail of shape and size as a means of discriminating between species has proved extremely frustrating. It can be stated, for instance, that the lemmas of *P. labillardieri* tend to be a little longer and proportionately narrower than those of *P. sieberana*, but inevitably in some specimens they will be the reverse.

A more useful, but still not completely reliable character can be found in the type and arrangement of hairs on the lower part of the back of the lemma; the upper part of the back is glabrous except that it is sometimes minutely scabrid. In *P. annua* all 5 nerves may be densely hairy below the middle, but occasionally 2, 4 or all the nerves may be glabrous. In *P. serpentum* and sometimes *P. umbricola* and *P. tenera* the lemma is entirely glabrous, as indeed it may also be in very occasional specimens of other species. However, in the majority of Australian species the hairs fall into one or other of two kinds of arrangement or, at times, a mixture of the two. The first pattern is exemplified by typical *P. labillardieri* in which the fine ciliate hairs are present only on the keel and the two lateral (as distinct from the median) nerves with sometimes a few on the margins at the base, the internerves remaining glabrous (see Fig. 1). The second pattern is exemplified by typical *P. sieberana* in which the lower back is pubescent more or less uniformly with short and/or almost woolly hairs, sometimes with rather longer ciliate hairs on the keel (see Fig. 2). So many species are, however, distinctly inconsistent in hair pattern or combine some of the characteristics of both that this feature has to be used as a subsidiary rather than a major key character or many species keyed out under both headings. Sometimes, as pointed out by Bor (l.c.) the hairs may be caducous and lost with maturity, or at other times, I am convinced, they simply fail to develop. Often the hairs are clearly visible on some lemmas and absent from others on the same specimen. Nevertheless a careful assessment of the hair pattern should be made whenever identification is attempted.

In most species the nerves are by no means prominent on the outer surface. In a few species, however, such as *P. queenslandica* and *P. fax*, they are prominently raised above the surface.

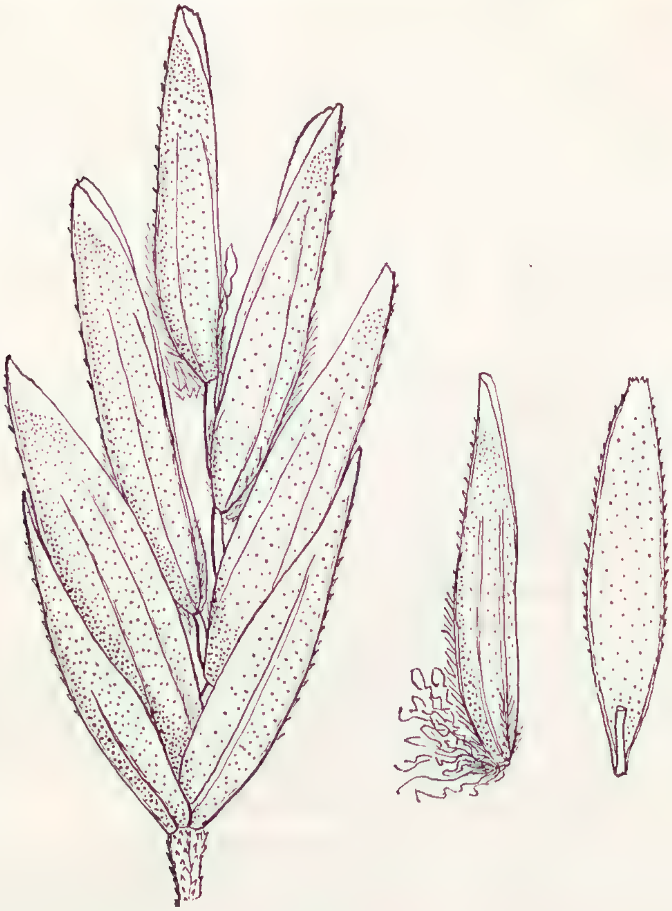


Fig. 1. *Poa labillardieri*, spikelet, lemma (in side view), and palea. × 16.

Palea. The palea is 2-keeled with hyaline marginal flaps that are bent back sharply against its inner surface. The tissue between the keels is usually granular with silica cells and otherwise more or less glabrous, scabrous, or pubescent with short hairs, on the adaxial surface.

In some species, e.g. *P. poiformis* and *P. labillardieri*, the keels are finely scabrous with forwardly directed teeth, these generally diminishing downwards so that the lower third of the keel is smooth. In others, e.g. *P. sieberana*, approximately the upper third to half is similarly scabrid, then the teeth are prolonged into delicate, fine, somewhat crinkled hairs diminishing again towards the smooth basal portion. These fine hairs are at times difficult to see, and indeed may at times be obsolescent, but they can generally be detected more readily if the palea is soaked and floated out in a little dilute detergent. With experience they can generally be detected without resorting to this measure and are often found to be lying folded over and closely appressed to the flap of the palea.

In *P. saxicola* the hairs on the keels are clearly in more than a single row, but in other Australian species the hairs or scabrous teeth appear to be essentially in one row.

In the species here considered the paleae are subequal to or slightly shorter than the lemmas. The relative length changes during development of the floret as

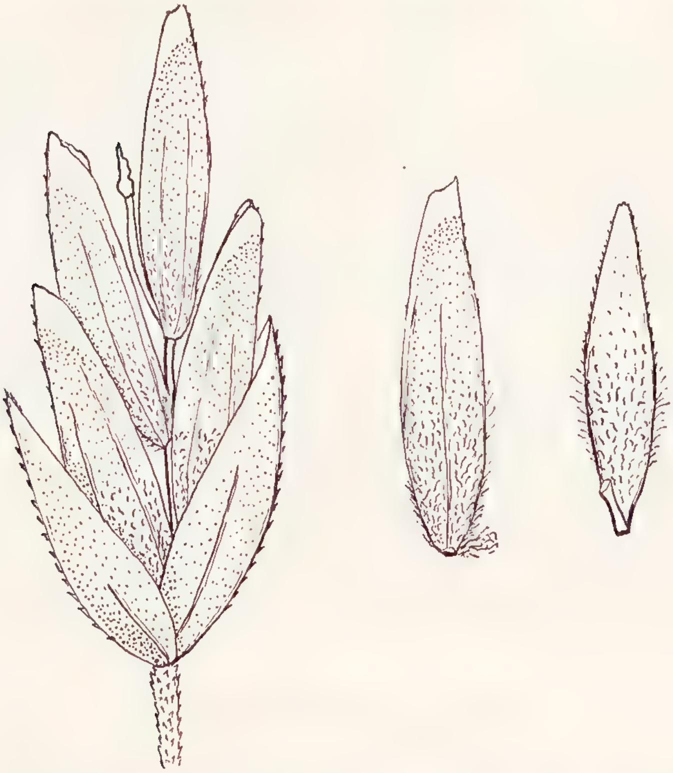


Fig. 2. *Poa sieberana*, spikelet, lemma (in side view), and palea. × 16.

growth of the palea and flower is somewhat delayed in comparison with that of the lemma. No generally useful character relating to relative length has emerged.

In species with longer and narrower lemmas, the palea is similarly long and narrow. In those with shorter lemmas the palea is shorter and may in consequence appear proportionately broader. In *P. saxicola*, which has broadly ovate lemmas, the palea is often ovate.

The Flower. In the Australian species of *Poa*, all the florets except the uppermost rudimentary floret (and perhaps the one beneath it) are usually hermaphrodite, and there is no differentiation into dioecious plants or monoecious spikelets in the species considered. In *P. arachnifera*, however, which has been introduced to this country but is not known to be naturalised, the plants are dioecious and the spikelets of the male and female panicles are markedly different.

The two lodicules are membranous and more or less unequally 2–toothed or –lobed.

There are three stamens, each consisting of a long delicate filament surmounted by a 2-locular anther opening by longitudinal slits. In some countries the size of the anthers has provided a useful diagnostic character, but in the closely knit group of species which has provided most of the problems in this present study it is not surprising that no useful diagnostic differences in size, nor in the variously plain yellow or purple-dotted colourations, have emerged.

The gynoecium consists of a one-celled ovary with two styles and two short plumose stigmas.

The grain is convex on one side and very shallow furrowed on the other. The hilum is basal and punctiform.

Proliferation. Proliferation of the spikelets (i.e. development of leafy vegetative buds above the glumes in place of normal florets) is a fairly common phenomenon in *Poa bulbosa* (and certain other extra-Australian species). Hubbard (Grasses (1954) 147) states that the proliferous variant is occasionally cultivated in gardens in England, from which statement it could be deduced that it has a genetic basis. Youngner (Amer. Journ. Bot. XLVII (1960) 753–757), after examination of 30 strains, found that "there was a large variation in degree of proliferation between strains and within strains at different seasons. Some plants were observed to have entirely proliferated panicles in the winter, but panicles consisting of all, or nearly all, normal spikelets in late spring." He conducted controlled experiments to determine the environmental factors influencing inflorescence initiation and development of proliferation and concluded that normal florets develop under conditions of high temperatures and long days, and that "bulbils" developed in their place under conditions of low temperatures and short days. Some observers have noted that proliferation is particularly common in very wet seasons.

Occasional proliferating spikelets have been found rather rarely on some Australian species, notably *P. costiniana*, *P. hiemata*, *P. gunnii* and *P. labillardieri*.

KEY TO THE SPECIES

1. Small annuals with soft herbaceous leaves. Ligules thinly membranous, glabrous. Web absent.

    2. Panicle narrow with the spikelets mostly rather erect and appressed to the branches. Lemmas usually 9– to 11–nerved. Interior .... *P. fax* 1.

    2.* Panicle triangular to ovate with more or less stiffly spreading capillary branches. Lemma manifestly 5–nerved. Cosmopolitan weed .... *P. annua* 2.

1.* Perennials. Ligules and web various.

    3. Plants bulbous or nodular or otherwise with manifestly thickened internodes at the base.

        4. Plants bulbous at the base with elongate-conical or pear-shaped bulbs composed of the enlarged and fleshy inner basal leaf-sheaths. Blades thin, flat or folded. Ligule membranous, glabrous, 2–8 mm. long. Panicle small, dense, ovate or oblong, or larger and then the spikelets "viviparous". Web rather copious .... *P. bulbosa* 3.

        4.* Plants nodular or with thickened internodes at the base.

            5. Spikelets turgid, very broadly oblong-ovate. Lemma only very slightly laterally compressed, 3–7 mm. long. Web absent or very scanty. Culms from a shortly creeping, branching rhizome, the lower internodes usually swollen into globular or ovoid nodules. Sheaths glabrous. Ligule thinly membranous, 2–6 mm. long, smooth or minutely scabrid on the back. Blades flat or loosely folded, scabrous on the prominent nerves. Interior .... *P. drummondiana* 4.

            5.* Spikelets compressed. Lemma 2–3·5 mm. long. Web scanty to copious. Plants caespitose from a contracted rootstock, the lowest internodes of the culms often more or less swollen into elongate or rarely globular yellowish nodules. Sheaths loosely or closely pubescent with fine hairs or scabrous-pubescent. Ligule ca. 1·5 mm. long, entire or minutely ciliolate at the apex, puberulous on the back. Blades flat to more or less inrolled, more or less loosely pubescent to scabrous-pubescent. South Australia. .. *P. crassicaudex* 34.

    3.* Plants not bulbous nor manifestly thickened at the base.

        6. Panicle linear with short erect branches and few turgid spikelets. Lemma 4–5·5 mm. long, very broadly ovate and cymbiform, firm, subchartaceous, glabrous on the back. Palea ovate to lanceolate-elliptical, usually shorter than the lemma, densely ciliate (with cilia in more than one row) on the keels. Blades folded, or more or less expanded in vivo. Ligule 1–4·5 mm. long, truncate, jagged-ciliolate at the apex, often slightly scabrous-pubescent on the back. High mountains of Tas., Vic. and southern N.S.W. .... *P. saxicola* 5.

        6.* Panicle at maturity more or less pyramidal and spreading, or if contracted then with numerous spikelets. Lemma various but always narrower than the preceding. Palea various but never so broad as the preceding nor so densely ciliate on the keels.

7. All internodes of the culms strongly compressed and 2-sided. Panicles mostly contracted. (cf. also *P. fordeana.*)

8. Culms few or many together apparently from an oblique or creeping scaly rhizome, very flat and 2-edged, leafy, with the internodes mostly concealed by the keeled sheaths which are fused around the culm almost up to the orifice. Ligule prominent, 2–7 mm. long, obtuse to more or less acute. Blades thin and flat. Web absent. Lemma 2·2–4·5 mm. long, prominently 5-nerved. Palea scabrous on the keels above and finely ciliolate below and pubescent on the back or both cilia and pubescence wanting. Western Australia .... *P. homomalla* 6.

8.* Culms single or in loose tufts, erect or ascending from a wiry rhizome, narrowly oval in cross section. Sheaths open, not fused around the culm. Ligule 0·5–3 mm. long, obtuse. Blades stiff, folded. Web present or absent. Lemma 2–3 mm. long, very obscurely 5-nerved. Palea finely scabrous on the keels, glabrous on the back........ *P. compressa* 7.

7.* Internodes terete or only slightly compressed (often strongly in *P. fordeana*), or only the peduncle or lower internodes compressed, or compressed only just below the nodes, or if rarely more or less compressed then the culms not prominently leafy and concealed by the fused sheaths or the lemma not prominently nerved or the panicle not contracted.

9. Blades smooth or scabrous on the lower (outer) surface but not manifestly pubescent or hirsute, except sometimes loosely hispid in *P. hookeri.*

10. Ligule thinly membranous, usually not or scarcely and inconspicuously puberulous or scabrous on the back (but more or less scabrous in *P. hookeri*) or ciliolate at the apex, 2 mm. or more in length or rarely less.

11. Blades broad and flat, 4–15 mm. wide. Loosely caespitose perennial with leafy, 5- to 9-noded culms 50–150 cm. high. Lemma with very prominent nerves. Rainforest margins in N.S.W. and Queensland .... *P. queenslandica* 8.

11.* Blades not more than 6 mm. wide. Plants shorter or more slender.

12. Ligule acute to acuminate. Creeping rhizomes not developed.

13. Ligule 4–10 mm. long. Loosely tufted with extravaginal innovations and creeping leafy stolon. Blades flat or folded, finely scabrous to subsmooth. Lemma rather distinctly dorsally curved .... *P. trivialis* 9.

13.*Ligule 1–4·5 mm. long. Caespitose with mostly intravaginal innovations. Blades inrolled, capillary, loosely hispid to scabrous. Lemma not distinctly dorsally curved. Tasmania .... *P. hookeri* 30.

12.* Ligule obtuse or truncate, usually not more than 5 mm. long. Plants with creeping scaly rhizomes and mostly extravaginal aerial shoots with thinly papery scales at the base.

14. Spikelets at maturity about 8–10 mm. long, strongly compressed. Lemma 3·5–5 mm. long, very obtuse, usually more or less woolly-hairy all over the back in the lower part. Sheaths tubular below. Blades flat, lightly to strongly scabrous, slightly tapering upwards. Interior .... *P. fordeana* 10.

14.* Spikelets 2·5–6 mm. long, compressed but somewhat turgid. Lemma 2·5–4 mm. long, obtuse to slightly pointed, herbaceous, hairy on the keel and marginal nerves in the lower part but not on the internerves. Sheaths open. Blades folded or expanded, not or scarcely tapering below the abruptly pointed tip, smooth to slightly scabrous *P. pratensis* 11.

10.* Ligule firmly membranous, usually more or less puberulous or scabrous on the back and/or ciliolate at the apex, 0·1–2 mm. long or rarely longer (–3 mm. in *P. costiniana*), or more or less reduced to cilia.

15. Blades (or at least some of them) flat and usually expanded at least in vivo, or folded and the margins sometimes inrolled on drying, either broad or narrow.

16. Stems often leafy and branching from the aerial nodes, or stoloniferous.

17. Aerial shoots often extravaginal. Lemmas usually pubescent on the internerves on the lower back (more rarely completely glabrous in *P. tenera*).

18. Blades firm, 1–5 mm. wide when expanded. Plants comparatively robust and erect. Web usually present. Panicle 5–18 cm. long with many spikelets. Chiefly Central Coast and Tablelands of N.S.W. ...... *P. affinis* 13.

18.* Blades soft, 1–1·5 mm. wide when expanded, more or less filiform. Plants flaccid, often trailing. Web usually obsolete. Panicle 2–12 cm. long with few spikelets on delicately spreading, capillary branches .... *P. tenera* 12.

17.* Aerial shoots usually intravaginal. Blades firm, 1–2 mm. wide. Web scanty or absent. Panicle 3–15 cm. long with many spikelets. Lemma glabrous or with sparse hairs on the keels and nerves, very rarely on the internerves. South Australia .... *P. umbricola* 17.

16.* Leaves and shoots mostly from the base, the plants caespitose or rhizomatous.

19. Plants commonly developing horizontal rhizomes which initiate new shoots more or less remote from the parent tussock; extravaginal shoots with scales usually present.

20. Lower leaf-sheaths not purplish. Lemmas glabrous on the internerves. Palea scabrous upwards and smooth downwards on the keels.

21. Leaf-blades herbaceous, not or scarcely rigid, often rather dark green. Rhizomes slender with thin pointed scales. Panicles often rather contracted and dense, the spikelets compressed but rather turgid .... *P. pratensis* 11.

21.* Leaf-blades relatively rigid, green. Rhizomes short, rather thicker and more rigid with firm obtuse scales. Panicle at length loosely spreading, the spikelets strongly compressed .... *P. cheelii* 18.

20.* Lower leaf-sheaths usually exhibiting some greater or less degree of purplish colouration. Lemmas often more or less pubescent on the internerves. Leaf-blades 1·5–5 mm. wide, usually dull or darkish green.

22. Lemmas mostly 2·75–5 mm. long. Rhizomes usually more or less elongate. Mountains of southern N.S.W. and Victoria.

23. Leaf-blades thinly sprinkled with short or elongate fine hairs up to 0·5 mm. long on the upper surface. Lower sheaths usually finely scabrous-pubescent, rarely only scabrid or subsmooth .... *P. hothamensis* 15.

23.* Leaf-blades smooth to scabrous on the upper surface but without elongate hairs. Lower sheaths finely scabrid or smooth .... *P. ensiformis* 14.

22.* Lemmas mostly 1·75–3 mm. long. Rhizomes, if present, only short. South Australia .. *P. clelandii* 16.

19.* Plants caespitose and not normally developing rhizomes (though these may rarely occur, e.g. in response to change of soil-level, they seldom extend beyond the margins of the tussock).

24. Web absent and lemma entirely devoid of hairs. Blades mostly smooth on the lower (outer) surface. Western Australia .... *P. serpentum* 19.

24.* Either the web present or the lemma bearing some hairs or both (very rarely the lemma quite glabrous and the web absent in *P. labillardieri*).

25. Panicle usually contracted and more or less linear, or if sometimes with widely spreading branches then usually at least some of the branches short and with spikelets almost to their bases. Blades generally very smooth on the lower (outer) surface, very rarely faintly scabrous. Spikelets often rather large (6–10 mm.). Lemma 3–6 (usually 4–5) mm. long, hairy on the keel and lateral nerves (very rarely on the internerves), the surface often with rather prominent stone cells and scabrous upwards. Web commonly copious. Coastal and estuarine foreshores .... *P. poiformis* 23.

25.* Panicle at length widely spreading and branches devoid of spikelets in the lower part.

26. Palea scabrous on the keels above and not or very rarely ciliolate below. Lemmas more or less hairy on the keels and lateral nerves but not or very rarely on the internerves. Lower sheaths not or rarely purplish.

27. Leaves virtually smooth, at least to the touch. Western Australia .... *P. porphyroclados* 20.

27.* Leaves generally scabrous.

28. Blades 1–3·5 mm. wide, dull green, greyish-green or glaucous-green, flat or with rolled margins. Peduncle usually more or less terete below the panicle. The common large tussock grass of alluvial, moist or sheltered sites below 5,500 feet in eastern Australia .... *P. labillardieri* 21.

28.* Blades 3–8 mm. wide, usually a fresh light green in vivo, flat or folded, or the margins somewhat rolled on drying. Peduncle usually compressed below the panicle. Coarse tussocks in soakage areas or small streams, mostly at 4,000–6,000 feet on inland mountains or above 2,000 feet on coastal ranges of southern N.S.W. and Victoria .... *P. helmsii* 22.

26.* Palea usually scabrous on the keels above and finely ciliolate below. Lemmas generally more or less pubescent on the internerves.

29. Sheaths often purplish at the base. Loosely or densely caespitose with numerous extra-vaginal shoots with firm broad scales. South Australia .... *P. clelandii* 16.

29.* Sheaths not or rarely purplish at the base.

30. Sheaths scabrous or smooth, not pubescent .... *P. labillardieri* 21.

30.* Sheaths usually more or less pubescent or scabrous-pubescent. South Australia .... *P. crassicaudex* 34.

15.* Blades closely folded and/or usually the margins also rolled and overlapping so that the blade is more or less angular-terete, narrow.

31. Blades more or less rigid, virtually smooth (at least to the touch) on the outer surface except sometimes at the base.

32. Small plant with elongate slender rhizomes. Kangaroo Island .... *P. halmaturina* 24.

32.* Rhizomes not or rarely developed.

33. Lemmas hairy chiefly on the keels and lateral nerves (more rarely with a few loose hairs on the internerves), or devoid of hairs. Lower sheaths mostly pallid.

34. Panicles usually contracted, or if sometimes with spreading branches then usually at least some of them short and with spikelets almost to their bases. Lemma often rather prominently marked with stone cells. Blades usually more or less convolute. Tussocks usually large and dense, with intravaginal and sometimes extravaginal shoots. Coastal and estuarine foreshores .... *P. poiformis* 23.

34.* Panicle at length spreading, the branches devoid of spikelets in the lower part. Stone cells of the lemma usually not very prominent. Blades mostly folded rather than rolled. Tussocks not or seldom large. Shoots intravaginal. Subalpine and alpine bogs or meadows of eastern Australia.

35. Lemma 3–4·5 mm. but usually about 3·5 mm. long, more or less oblong or elliptical. Mountains of Tasmania .... *P. gunnii* 28.

35.* Lemma 3·5–5·5 mm. but usually about 4·5 mm. long, usually lanceolate. Wet places on the high mountains of southern N.S.W. and Victoria .... *P. costiniana* 27.

33.* Lemmas usually more or less pubescent on the lower part of the back. Lower sheaths often purplish and blades often bluish. Subalpine meadows of the Australian Alps .... *P. fawcettiae* 33.

31.* Blades not rigid or, if so, then scabrous.

36. Blades rigid and scabrous, sometimes subsmooth in *P. gunnii.*

37. Lower sheaths usually purplish.

38. Palea scabrous on the keels above and ciliolate below. Lemmas usually closely pubescent on the internerves on the lower back. Leaves in vivo usually distinctly bluish .... *P. phillipsiana* 29.

38.* Palea scabrous on the keels, not ciliolate. Lemma pubescent chiefly on the keel and lateral nerves, sometimes with a few loose hairs on the internerves. Leaves often slightly bluish *P. labillardieri* var. *acris* 21.

37.* Lower sheaths not purplish. Leaves green, not bluish. Lemmas usually glabrous on the internerves or entirely glabrous. Palea scabrous on the keels upwards, smooth below .... *P. gunnii* 28.

36.* Blades not or scarcely rigid. Lower sheaths not or very rarely purplish (but usually purplish in *P. fawcettiae*).

39. Culms at times branching to form fascicles of aerial shoots, or stoloniferous and trailing. Leaves fine. Panicle with few small spikelets on delicately spreading capillary branches.

40. Tussocks soft and flaccid, the aerial shoots mostly extravaginal. Web often obsolete. Lemma finely pubescent on the lower back or quite glabrous. Leaves green .... *P. tenera* 12.

40.* Tussocks not flaccid, the aerial shoots mostly intravaginal, Lemma usually finely pubescent on the lower back. Leaves often bluish .... *P. sieberana* var. *cyanophylla* 31.

39.* Tussocks not stoloniferous, aerial shoots not or very rarely produced.

41. Web absent. Lemma entirely glabrous. Palea scabrous on the keels upwards, not ciliolate.

42. Tussocks large with rather coarse leaves mostly smooth on the lower surface. Western Australia .... *P. serpentum* 19.

42.* Tussocks small with very fine, inrolled, lightly to closely scabrous blades. Subalpine meadows of southern N.S.W. .... *P. clivicola* 26.

41.* Either the web present or the lemma bearing some hairs or both (very rarely otherwise in abnormal specimens of *P. labillardieri* and *P. sieberana*).

43. Lemmas hairy in the lower part on the keels and lateral nerves but usually not on the internerves. Web usually present. Palea scabrous on the keels above, not (or very rarely) ciliolate below.

44. Tussocks generally large and coarse (though sometimes smaller under adverse conditions).

45. Leaves virtually smooth to the touch. Western Australia .... *P. porphyroclados* 20.

45.* Leaves usually lightly to harshly scabrous .... *P. labillardieri* 21.

44.* Tussocks small and fine-leafed.

46. Glumes narrow. Lemmas 2–3·5 mm. long, usually narrow. Coastal districts of southern N.S.W., Victoria and SE South Australia .... *P. exilis* 25.

46.* Glumes rather broad to broad. Lemmas 3–4·5 mm. long.

47. Lemma linear-lanceolate to lanceolate, acute to subacute. Mountain slopes of southern N.S.W. and Victoria .... *P. clivicola* 26.

47.* Lemma oblong, obtuse or subacute, Mountains of Tasmania .... *P. gunnii* 28.

43.* Lemmas hairy on the internerves on the lower back, with or without longer and/or denser hairs on the keels and lateral nerves (or rarely the hairs more or less suppressed). Palea usually scabrous above and ciliolate below on the keels.

48. Blades smooth to the touch

49. Blades rather soft, not rigid, usually bright green in vivo. Alpine meadows of southern N.S.W. and Victoria, mostly above the snow-line .... *P. hiemata* 32.

49.* Blades more rigid than the preceding, usually bluish. High mountains of southern N.S.W. and Victoria .... *P. fawcettiae* 33.

48.* Blades usually more or less scabrous.

50. Blades beset with very dense fine scabrous emergences. Tasmania (and probably southern Victoria) .... *P. rodwayi* 35.

50.* Blades closely or sparsely beset with scabrous emergences but not so densely and finely as in the preceding.

51. Sheaths usually loosely or closely pubescent or scabrous-pubescent. South Australia ...... *P. crassicaudex* 34.

51.* Sheaths smooth or scabrous but not pubescent.

52. Leaves mostly green to greyish-green, more rarely glaucous-green. The common fine tussock grass of eastern Australia .... *P. sieberana* var. *sieberana* 31.

52.* Leaves often bluish, very fine .... *P. sieberana* var. *cyanophylla* 31.

9.* Blades pubescent or hirsute on the lower (outer) surface, occasionally the hairs more or less evanescent, the sheaths also often pubescent or hirsute. Lemmas mostly pubescent on the interverves as well as on the keels on the lower back (except often in *P. mollis*). Palea generally scabrous on the keels upwards and finely ciliolate below.

53. Blades sparsely or rather closely beset with rather stiff hairs (elongated scabrous emergences), inrolled .... *P. sieberana* var. *hirtella* 31.

53.* Blades either very densely and often velvety hairy with long or short hairs, or the hairs, when sparse, fine and long.

54. Blades shortly hairy with the hairs in two lengths, or else distinctly and strongly scabrous between the hairs, more or less loosely inrolled .... *P. induta* 36.

54.* Hairs on the blades more or less equal in length, or if in two lengths then the longer hairs very fine and soft and the blades often more or less expanded.

55. Blades always inrolled, with dense, rather short, soft hairs.

56. Lemmas mostly 3–4 mm. long. Lower sheaths usually purplish. At rather high altitudes on stony soils in the Australian Alps in N.S.W. .... *P. petrophila* 37.

56.* Lemmas mostly 2·5–3 mm. long. Lower sheaths pallid. Tasmania (and possibly southern Victoria) ...... *P. rodwayi* 35.

55.* Blades often flat in vivo, or folded or loosely inrolled.

57. Lower sheaths often purplish. Plants loosely tufted. Blades bluish or greyish, densely and softly hairy. Lemma usually glabrous on the internerves but with fine hairs on the keel. Palea either scabrous only or scabrous and ciliolate on the keels. Northern Tasmania ...... *P. mollis* 39.

57.* Lower sheaths generally pallid. Lemma generally pubescent on the internerves on the lower back. Palea scabrous upwards and ciliolate below on the keels.

58. Leaves from densely hairy and greyish-green to rather sparsely hairy, but the hairs generally long and fine, sometimes long and short hairs inter-mingling. Lower internodes not swollen. Mostly in Victoria .. *P. morrisii* 38.

58.* Blades rather loosely, rarely densely, pubescent. Lower internodes often somewhat swollen. Mostly in South Australia .... *P. crassicaudex* 34.

1. P. fax *Willis et Court* in Muelleria I, No. 1 (1956) 45; Willis, Handb. Pl. Vict. (1962) 99.

Basionym: *Poa lepida* F. Muell. Lectotype: Between the Darling and Lachlan Rivers, Burkitt (MEL). Syntypes: Crystal Brook, F. Mueller (MEL; K); Murray River, F. Mueller (MEL); Rivoli Bay, South Australia, F. Mueller ca. 1847 (NSW 38162); Mt. Alexander, Stuart (MEL).

Synonym: *P. lepida* F. Muell., Fragm. VIII (1873) 130 non *P. lepida* Nees ex Steud. (1854), nec *P. lepida* A. Rich. (1851); Benth., Fl. Austral. VII (1878) 654; Moore & Betche, Handb. Fl. N.S.W. (1893) 491; Maiden, Man. Grasses N.S.W. (1898) 182; Black, Fl. S. Austral. ed. I (1922) 80 and ed. II (1943) 124; Ewart, Fl. Vict. (1931) 162; Gardner, Fl. W. Austral. I (1952) 107.

Small, erect annual, 5–30 (rarely –45) cm. high. Culms 2– to 3–noded, slender, striate, slightly scabrous or rarely closely scabrid-hispid. Sheaths thin, manifestly striate, the lower becoming loose, usually more or less glabrous, rarely closely scabrous-hispid. Ligule thinly membranous, glabrous, 1–4 mm. long, obtuse to acute, often jagged. Blades flat, thin, flaccid, mostly 2–5 cm. long and 1–2·5 mm. wide, linear with a short keeled apex, sometimes slightly auricled at the base, few-nerved, usually slightly scabrous on the margins and nerves, rarely closely scabrous-hispid. Panicle long-exserted, 3–15 cm. long, usually narrow, linear and more or less spike-like with few, solitary, short, appressed branches rarely up to 2 cm. long, or subracemose, or sometimes short, dense and more or less oval-oblong, the rhachis, branches and pedicels usually glabrous or slightly scabrous, rarely distinctly scabrous-hispid. Pedicels mostly 0·5–3 mm. long. Spikelets rather erect and appressed to the branches or rhachis and often rather clustered, very strongly compressed, ovate to oval-oblong, 5– to 13–flowered with the florets not very crowded, up to 13 × 6 mm. (but often smaller), pale or greenish or purplish, often with the lemmas having a purplish or golden-brown subapical band. Lower glume about $\frac{1}{2}$–$\frac{2}{3}$ as long as the lower lemma, the upper glume a little longer, about 2–5 mm., both subacute to obtuse, thinly herbaceous and often with a broad scarious band along the margins and apex, cymbiform, keeled, ovate to linear-oblong, usually 3– to 5–nerved (rarely 1– or 7–nerved), sometimes furrowed between the nerves, usually glabrous and smooth throughout or slightly scabrous on the keels, or rarely the whole surface loosely scabrous-hirsute. Rhachilla joints up to 1 mm. long, glabrous. Web absent. Lemmas mostly 3·5–4·5 mm. long, strongly keeled, more or less linear when folded, very obtuse, herbaceous with a broad scarious band around the margins and apex, prominently 9– to 11–nerved (usually) and furrowed between the nerves (but sometimes some or all of the alternate nerves obsolete and the lemma only 5– to 7–nerved and scarcely furrowed), smooth or scabrous on the nerves above and usually densely clothed on the nerves and margins below with white, more or less appressed, rather stiffly silky-woolly hairs, the hairs on the keel extending up to about the middle of the lemma, or sometimes some of the lines of hairs obsolete to a varying degree (in extreme cases only the keels and margins hairy). Palea linear, up to as long as the lemma, often furrowed between the keels, usually finely scabrous on the keels above and with long fine hairs on the keels below, or these hairs variously reduced or the keels rarely scabrous throughout or smooth throughout. Anthers 2–3 mm. long, pallid. Grain free from the palea, 0·6–2 mm. long, oblong, 3–angled, brown. Stigmas more or less sessile. "Scaly Poa" or "Scaly Meadow Grass".

Chiefly southern Australia in areas of moderately low rainfall and (probably) somewhat saline conditions.

New South Wales: Narrabri, J.L. Boorman 9.1910 (NSW 38163; K); western interior of N.S.W., C. Moore 1880 (MEL); Liverpool Plains, 2.1889 (NSW 38160; AD); Lake Cudgellico (Cargellico), J. L. Boorman 2.10.1906 (NSW 38164; K; AD); 30 miles NW of Balranald, J.H. Leigh No. W281, 12.8.1968 (NSW 100567).

VICTORIA: Hume River, Jephcott 1883 (MEL); between the Wimmera and Richardson River, Curdie 1875 (MEL); Yambuk, H.B. Williamson 11.1901 (MEL); Port Fairy, H.B. Williamson 11.1901 (MEL; NSW 38161; ADW; PERTH); Bridgewater, A.C. Beauglehole No. 721, 11.1946 (NSW 82603).

SOUTH AUSTRALIA: Murray River, F. Mueller (MEL); Lake Bonney, C. Wehl 1882 (Mel); Mt. Gambier, Well 1880 (MEL) (differs in the lemma being scabrous on the nerves but otherwise glabrous); Edillie, J.M. Black 10.1911 (AD); Wellington, ?R. Tate 3.10.1880 (AD); Bowaka, salt water ti-tree swamp, common, R.L. Crocker, 9.12.1939 and 3.1940 (ADW 4128, 4129); Fowlers Bay, Richards 1880 (MEL); Fowlers Bay (AD); Port Lincoln 10.1893 (AD), all parts hispid; 2 miles from Smoky Cape, deep sand, F.M. Hilton 25.8.1955 (ADW 18210, 18211, 18212); Fishery Bay, 20 miles SW of Port Lincoln, Eyre Peninsula, sand dunes, D.E. Symon 13.11.1960 (ADW); Kangaroo Island, sand dune near mouth of the Sou' West River, Hj. Eichler No. 15324, 9.11.1953 (AD).

WESTERN AUSTRALIA: Eucla, Richards 1877 (MEL); Eurio, near Eucla 8.1880 (MEL).

2. *P. annua *L.*, Sp. Pl. (1753) 68; Benth., Fl. Austral. VII (1878) 654. A cosmopolitan grass noted in the literature of a large part of the world. Figured in Agric. Gaz. N.S.W. XXIX (1918) 393; Breakwell, Grasses and Fodder Plants of N.S.W. (1923) 161; Hubbard, Grasses (1954) 144; and in many other works (see Index Londinensis).

Variable, loosely to compactly tufted, soft, flaccid, light green, glabrous annual, 2–30 cm. high. Culms erect, spreading or prostrate, sometimes geniculate at the nodes, sometimes rooting from the lower nodes, very slender and weak, simple or branched towards the base, often somewhat compressed, about 3-noded, smooth. Sheaths more or less compressed and keeled, striate, smooth. Ligule thinly membranous and glabrous, 2–5 mm. long, obtusely truncate. Blades flat, or folded when young, thin, soft, linear with blunt, keeled tips, 0·5–12 cm. long and 1–5 mm. broad, smooth or very minutely scaberulous except minutely scabrous on the margins, the young blades often crinkled. Panicle triangular to ovate, 1–12 cm. long, from somewhat loose to somewhat dense, the capillary branches more or less stiffly spreading, the lower whorl mostly 2-nate or solitary, the branches rather short (1–5 cm.), mostly smooth, undivided and devoid of spikelets in the lower part, the pedicels 0·3–4 mm. long, smooth or extremely sparsely finely scabrous. Spikelets ovate or oblong, 3- to 10-flowered. Glumes acute or obtuse, keeled, the lower lanceolate to ovate, 1·5–3 mm. long, 1- to 3-nerved, the upper elliptic or oblong or somewhat rhomboid, 2–4 mm. long, 3-nerved, both smooth, rarely faintly scabrous on the keels. Web absent. Lemma 2·5–4 mm. long, very obtuse to almost truncate, keeled, thinly herbaceous with a broad hyaline apex, oblong, broad, prominently 5-nerved, the internerves usually glabrous, the nerves all densely hairy below the middle or else 2 or 4 of the nerves hairless or rarely all hairless. Palea densely fringed with long fine hairs on the keels or rarely hairless, glabrous on the back. Anthers 0·5–1·3 mm. long, pale yellow. Grain minutely striate-reticulate on the surface. Usually known in Australia as "Winter Grass". Other names are "Goose Grass" and "Annual Meadow Grass".

Regarded as native to Europe but now very widespread in temperate regions and extending to mountain regions in the tropics. Occurs in a variety of situations but particularly as a weed of cultivated land and other disturbed sites. Under most Australian conditions it flourishes during the winter and spring months but occasional plants may be found at any season when temperature and moisture conditions are favourable. Throughout temperate Australia (also NE Queensland).

QUEENSLAND: Yungaburra, C.W. Roseblade 7.1937 (BRI); Rockhampton, R. Simmons 8.1907 (NSW 45321); Roberts Plateau, on wet banks of Moran's Creek on rocks, ca. 3,000 feet, S.T. Blake No. 12997, 24.5.1937 (BRI); Petrie, at edge of North Pine River, S.T. Blake No. 81, 14.12.1930 (BRI); Bunya Mts., C.T. White No. 9155, 19.8.1933, introduced grass common in cleared patches (BRI), and 10.1919 (BRI); Brisbane, F.A. Rodway No. 10470, 12.1927 (NSW 45325); Botanic Gardens, Brisbane, abundant in lawns etc., C.E. Hubbard No. 8626, 25.8.1930 (K); Botanic Gardens, Brisbane, common in lawns in shade of trees, C.E. Hubbard No. 3270, 7.7.1930 (K); Brisbane, Botanic Gardens, under shade of trees, in lawns, very common, C.E. Hubbard No. 2559, 14.5.1930 (K); Toowong, S.L. Everist No. 1, 9.9.1930 (BRI); Ascot, Brisbane, edge of road by Brisbane River, common, C.E. Hubbard No. 3655, 13.8.1930 (K); Fraser Island, on nursery ground, in open, C.E. Hubbard No. 4566, 17–18.10.1930 (K); Toowoomba, weed in railway station yard, C.E. Hubbard No. 3508, 2.8.1930 (K); Taylor Range, near Brisbane, near water tank by roadside through eucalypt forest, C.E. Hubbard No. 3745, 24.8.1930 (K); Patangata (BRI); Oxenford, S of Brisbane, weed on railway track, common, C.E. Hubbard No. 3668, 17.8.1930 (K); Tambourine Mtn., ca. 45 miles S of Brisbane, weed near house in shade of verandah, red soil, 1,800 feet, C.E. Hubbard No. 2432, 3.5.1930 (K); Lamington Plateau, J. Shirley, 5.1911 (NSW 45320).

New South Wales: Clouds Creek, South Grafton, K.A. Kirby 8.11.1949 (NSW 45298): Inverell, E.A. Thomas 12.1912 (NSW 45315); Wangaratta, Cobar district, L. Abrahams 9.1910 (NSW 45313); Cobar, Haviland 11.1911 (NSW 45308); Montgomery Swamps, Leichhardt 12.6.1842 (NSW 45338); Rosemont, Mulgrave, J. Power 9.1912 (NSW 45305); Palm Beach, F.A. Rodway No. 10465, 1.9.1930 (NSW 45327); Cheltenham, J. Vickery 23.12.1947 (NSW 4780); Cheltenham, L.A.S. Johnson 19.8.1946 (NSW 45309); Governor's Domain, Sydney, J.H. Camfield (NSW 45311); Hyde Park, Sydney, F.A. Rodway No. 10464, 28.11.1928 (NSW 45328); Neutral Bay, J.B. Cleland 27.7.1911 (AD); Surry Hills, H. Deane 3.1881 (NSW 45304); Kogarah, J.H. Camfield (NSW 45295); Homebush, J. Vickery 21.6.1930 (NSW 45337; BRI; K); roadside near Parramatta, C.E. Hubbard No. 8177, 4.1931 (K); Hawkesbury Agricultural College, Richmond (NSW 45319); Woodford, D.L.W. Henderson No. F36, 3.1945 (NSW 45296); Medlow Bath, Blue Mts., F.A. Rodway No. 10466, 16.9.1929 (NSW 45326); Jenolan Caves, W.F. Blakely, 8.1900 (NSW 45312); Carcoar, M. Curran (MEL); Nowra, F.A. Rodway No. 10462, 5.1929 (NSW 45335); mouth of Shoalhaven River, F.A. Rodway No. 15439, 9.8.1951 (NSW 45336); Good Dog Mtn., Cambewarra Ra., F.A. Rodway 27.7.1930 (NSW 63682); Braidwood district, W. Bäuerlen 12.1886 (MEL); Kangaroo Valley, F.A. Rodway No. 10463, 5.1929 (NSW 45334); Bodalla (NSW 45314); Black Mountain, Canberra, E. Gauba 7.6.1956 (CBG 003398); Murrumbidgee, R.H. Bennett 1886 (MEL); Cootamundra, Crozier 11.1894 (NSW 45310); Stockinbingal, E. Breakwell (NSW 45307); Lavington F.J. Daves 10.1930 (NSW 45306); Yanco, H. Wenholz 8.1912 (NSW 45323); Mt. Erin, Wagga, 1.12.1934 (NSW 45301); Tulla, D.L.W. Henderson No. 123, ca. 1945 (NSW 45299); Daner's Gap, Mt. Kosciusko, 5,500 feet, L.A.S. Johnson & E.F. Constable 26.1.1951 (NSW 15977).

Lord Howe Island: L. Bingley 7.1947 (NSW 3731).

Victoria: Gippsland, F.M. Campbell (BRI); Orbost, F.A. Rodway No. 10467, 9.10.1933 (NSW 45331); Benalla, F.A. Rodway No. 10468, 25.10.1933 (NSW 45332); Puckapunyal, C. Davis 9.1942 (NSW 45330); Browns Camp, W. Bäuerlen 4.1887 (MEL); Melbourne, F.A. Rodway No. 10469, 19.4.1931 (NSW 45333); Melbourne, 1923 (ADW 503); Domain, Melbourne, C.E. Hubbard No. 8524, 4.1931 (K); Port Fairy, W.T. Whan (NSW 45324).

Tasmania: Wheat Store near Launceston, W.M. Curtis 27.10.1943 (K; HO); Woolnorth, R.C. Gunn No. 1483, 16.10.1837 (NSW 45316); Silver Falls, Fern Tree, F.A. Rodway No. 14358, 28.1.1947 (NSW 45329); Strahan, F.A. Rodway No. 10460, 22.10.1933 (NSW 45340); Russell River, Huon, A.V. Giblin 11.1929, H1178 (HO); Parattah, F.A. Rodway No. 10458, 18.4.1931 (NSW 45342); Gordon River, 10.1934 (SYD); Hobart Town, W.W. Spicer 1.1875 (HO); Hobart, L. Rodway 11.1928, H1178 (HO); Hobart, L. Rodway 20.8.1929, H1178 (HO); Mt. Wellington, 4,166 feet, F.A. Rodway No. 10461, 4.1926 (NSW 45339); Blackmans Bay, F.A. Rodway No. 10459, 15.4.1931 (NSW 45341); Ranelagh and Huon Valley, D. Martin 10.1934 and 11.1934 (NSW 45300).

South Australia: Meningie, L.D. Williams 8.1945 (LDW); between Mannum and Blanchetown, J.B. Cleland 29.11.1913 (AD); Edwardstown, M. Koch No. 920, 11.1902 (PERTH); Adelaide, F. Mueller ca. 1847 (NSW 45317); Adelaide, M. Koch No. 920, 11.1902 (NSW 45322); Adelaide, Hj. Eichler No. 13054, 15.10.1956 (AD; NSW 51265); Glen Osmond, R.M. Feuerheerdt 12.9.1955 (ADW 19043); Glen Osmond, D.E. Symon & E.L. Robertson No. 7171, 3.9.1951 (ADW); Waite Institute (Glen Osmond), D. Symon No. 6736, 5.10.1951 (ADW); Glen Osmond, J.B. Cleland 11.1920 (AD); North Adelaide, J.M. Black 20.10.1922 (AD); Norwood, J.M. Black 10.1903, 7.1904, 6.1906, 7.1906, 8.1910 and 9.1913 (AD); Hawker, J.M. Black 17.10.1917 (AD); Spalding and Broughton River, J.M. Black 6.11.1920 (AD); Bridgewater, J.M. Black 28.4.1937 (AD); Robe, J.M. Black 10.1910 (AD); Lake Alexandrina at Wellington, R. Tate (AD).

Western Australia: Mount Lawley, C.A. Gardener 14.8.1925 (PERTH); Muresk, E.T. Bailey No. 715, 9.1945 (PERTH); Perth, J.M. Black 8.1913 (AD); King's Park, F.M. Bennett 8.1943 (PERTH); West Perth, R. Helms 28.9.1898 (NSW 45297).

3. *P. bulbosa *L.*, Sp. Pl. I (1753) 70. Noted in the literature of most temperate regions. Figured in C.E. Hubbard, Grasses (1954) 146, and in numerous other references (see Index Londinensis). See also Halperin in Univ. Cal. Publ. Bot. XVI (1931) 171–183.

SYNONYM: *P. bulbosa* L. var. *vivipara* Koel., Descr. Gram. (1802) 189, the proliferous variant. This variant is figured in Hitchcock & Chase, Manual of the Grasses of the U.S. (1951) 124 and in other references (see Index Londinensis).

Tufted bulbous-based perennial, 5–40 cm. high, the bulbous portions elongate-conical or pear-shaped, the shoots intravaginal. Culms erect or geniculate-ascending or spreading, very slender, unbranched, smooth, 2– to 4–noded, the nodes glabrous. Sheaths glabrous and smooth, purplish or green, the inner basal sheaths pallid, enlarged and fleshy, the outer basal sheaths thin and membranous. Ligule membranous, acute to acuminate, 2–8 mm. long, sometimes laciniate, glabrous. Blades narrow, flat or folded or the margins inrolled, linear with an abrupt keeled apex, 1–10 cm. long, mostly 1–2·5 mm. wide, glabrous, usually more or less smooth except sometimes minutely scabrous on the keel especially near the apex or on the margins, rarely also scabrous on the nerves on the lower surface, soft or somewhat firm, thin, green or greyish-green, sometimes breaking up on drying. Panicle contracted and usually dense, ovate or oblong, about 2–6 cm. long and 1–2·5 cm. wide (often much larger in "viviparous" forms), the short branches more or less erect, slender, lightly scabrous, the pedicels 0·3–3 mm. long, scabrous. Spikelets ovate to broadly oblong, compressed, 3–5 mm. long, 3– to 6–flowered, variegated with green, purple and gold. Glumes keeled, acute to finely acuminate, cymbiform, 2–3 mm. long, scabrous on the keels, with broad smooth membranous margins, the lower ovate, 1– to 3–nerved, the upper broader and a little longer, 3–nerved. Web rather copious. Lemma 2·5–3·5 mm. long, acute, finely 5–nerved with the nerves not prominent, strongly keeled, lanceolate to lanceolate-oblong in side view, densely fringed with rather long hairs on the keel and marginal nerves, the median nerves or the internerves glabrous on the lower lemma but increasingly hairy on the upper lemmas. Palea scabrous on the keels above, grading to long scabrous or scabrous-ciliate below or scabrous throughout, glabrous on the back. Anthers 1–1·5 mm. long. "Bulbous Blue Grass", "Bulbous Meadow Grass" or "Bulbous Poa".

When the leaves and culms wither, the bulbous bases remain and may become detached and distributed by wind or other agencies, each forming the propagule of a new plant.

At times the part of the spikelet above the glumes is replaced by a miniature shoot (or "bulblet" or "bulbil") often with a dark purple base and the bracts extending into slender green tips which, under favourable conditions, may fall, take root and serve as a vegetative propagule. This form has been named var. *vivipara* Koel. but may not be genetically distinct. The condition is often conveniently but incorrectly termed "vivipary"; it has nothing to do with a germinating seed as in true vivipary, but is a replacement of the floral parts by a vegetative shoot. According to V.B. Youngner, in Amer. Journ. Bot. XLVII (1960) 753–757, inflorescence initiation in the strains of *Poa bulbosa* that he studied, was promoted by long days following vernalisation of one week or more at 10° C. Normal florets developed under high temperatures (21°–27° C) and long days (16 hours) following inflorescence initiation. Bulbils developed in place of normal florets under short days (8 hours) and low temperatures (ca. 20° C or below). Long days and low temperatures or short days and high temperatures produced panicles containing both normal florets and bulbils.

Widespread in the Mediterranean region and extending up the coast of Western Europe. Introduced into North America. Naturalised in Australia.

New South Wales: Normal Forms: Coolah, A.R. Beeson 10.1948 (NSW 45357); Gulgong, per Australian Fertilizer Ltd. 20.10.1938 (NSW 45346); Grattai, via Mudgee, near creek, K. Ingram 19.10.1952 (KI); Winburndale Rivulet, K. Ingram 6.10.1942 (KI); Swamp Creek, Bathurst, K. Ingram 15.10.1942 (KI); Wellington, A.C. Taylor 26.11.1956 (NSW 45343); Molong, J.B. Cleland 10.1913 (AD); Orange district, R.C. Madsen 1.11.1948 (NSW 6582); Tarana, per Soil Conservation Service 10.1940 (NSW 45364); Cowra, E. Breakwell 10.1912 (NSW 45358, 45359, 45360); Cowra Experiment Farm, G.O. Crawford 9.10.1942 (NSW 45363); Grenfell 2.1907 (NSW 45351); Grenfell, D. Wood 18.10.1939 (NSW 45365); Young, J.B. Cleland 11.1915 (NSW 45368; AD); Young, T.H. Paterson 10.10.1928 (NSW 60214); Cootamundra, R.L. Gammie 26.10.1964 (NSW 71630); Temora, O.R. Southwood 10.10.1963 (NSW 63701); Goulburn, L.J. Kaleski 8.10.1939 (NSW 45366); Goulburn, H.C.L. Bell (NSW 60123); Canberra, J. Vickery 1.11.1931 (NSW 45354); near Canberra, A.Y. Montgomery 9.1930 (NSW 60209); Black Mountain, Canberra, in grassland, E. Gauba 9.10.1951 (CBG 003026; ANU) and 10.10.1956 (CBG 003399); lower east slopes of Black Mtn., Canberra, R. Pullen No. 2262, 17.10.1960 (CANB); Canberra, P.R. Dunn 1.10.1964 (NSW 71218); Captains Flat, H.S.M. Gibson 22.10.1952 (NSW 45352); Burbong, R. Pullen No. 3885, 15.10.1963 (CANB; NSW 69431); Yass, W.D. Hardy 27.10.1945 (NSW 834); Holbrook, E.J. McBarron No. 1087, 28.9.1947 (NSW 45361); Hume Highway, Holbrook, E.J. McBarron No. 1132, 10.1947 (NSW 45362); Brocklesby district, R.J. Flynn 27.9.1963 (NSW 63663); Monument Hill, Albury, E.J. McBarron No. 2029, 18.9.1948 (NSW 45356); Barooga, J. Vickery 11.10.1949 (NSW 10041); Walla Walla, R.J. Flynn 24.9.1962 (NSW 57949). "Viviparous" Forms: Glen Innes Experiment Farm, 30.11.1950 (NSW 45350); New England Experiment Farm, W.T. Atkinson 12.12.1950 (NSW 45353); Howlong, G.R. Godden 19.11.1956 (NSW 45344); Albury, T.H. Paterson 25.10.1917 (NSW 45348); Albury district, R.J. Flynn 21.10.1963 (NSW 63741); Berridale, H. Flanagan 29.10.1958 (NSW 46146); Helstonleigh, Dalgety, H. Kelley 10.1911 (NSW 45349) and 11.1911 (NSW 45347).

Victoria: Newstead, near Stawell, F.M. Reader 1910 (AD); Geelong, H.B. Williamson 11.1905 (NSW 45367); Dimboola Wild Flower Reserve, A.C. Beauglehole No. 1571, 10.1948 (NSW 82602); 38 miles S of Horsham, T.B. Muir No. 1488, 22.10.1960 (MEL; NSW 85374); Mackenzie River at Zumsteins, T.B. Muir No. 1480, 22.10.1960 (MEL; NSW 85373).

South Australia: Melrose, R. Higginson 10.1951 (LDW); Booboorowie North, J.S.L. Marshall 18.10.1930 (ADW 508); 6 miles S of Burra, J.B. Cleland 23.9.1942 (AD); Clare, R. Higginson 8.10.1951 (LDW); Prop. Coleman, Saddleworth, D.E. Symon 27.10.1960 (ADW 23166); Kapunda, J.B. Cleland 24.9.1938 (AD); between Corny Point and Daly Head, Yorke Pen., D.E. Symon 9.10.1952 (ADW 8107); Netherby, L.M. Wright 18.9.1948 (ADW 5932); Netherby, D.E. Symon 28.6.1951 (ADW 6733); South Parklands, Adelaide, T.G.B. Osborn 11.1916 (AD), "viviparous"; North Parklands beyond Montefiore, Adelaide, J.M. Black 27.8.1942 (AD); Adelaide, in water, J.B. Cleland 6.10.1929 (AD); banks of Torrens, J.M. Black 18.9.1931 (AD); Reserve above right bank of Torrens below bridge at Zoo (Adelaide), J.M. Black 11.10.1909 (AD); Glen Osmond Hills, J.B. Cleland 9.10.1955 (AD); Glen Osmond, in fields, J.B. Cleland 1929 (AD); Waite Institute, Glen Osmond, C.M. Eardley 5.9.1933 (ADW 509), "viviparous"; Highfield, Beaumont, J.B. Cleland 5.10.1941 (AD); National Park, J.B. Cleland 26.9.1942 and 9.10.1943 (AD); West Parklands on way to Henley Beach, herb. J.M. Black 17.10.1910 (AD), partially "viviparous" (some spikelets with a normal floret and a vegetative shoot); Naracoorte, Penola Plain "Limestone Ridge", N.S. Tiver 21.9.1945 (ADW 14276); Robe, J.M. Black, 10.1910 (AD) 2 sheets, one normal the other "viviparous"; Meningie, L.D. Williams 9.1945 (LDW); Talia, herb. J.M. Black 10.1931 (AD); Kangaroo Island, Kingscote, J.B. Cleland 23.9.1953 (AD).

Western Australia: Muresk, C.A. Gardner 10.1934 (PERTH) normal and "viviparous"; Muresk, E.T. Bailey No. 76, 9.1.1947 (PERTH).

4. P. drummondiana *Nees* in Hook. Lond. Journ. Bot. II (1843) 418; Steud., Syn. Pl. Gram. (1854) 262; Black, Fl. S. Austral. ed. I (1922) 80 and ed. II (1943) 124; Ewart, Fl. Vict. (1931) 164; Gardner, Enum. Pl. Aust. Occ. (1931) 10; Gardner, Fl. West. Austral. I, Part 1 (1952) 107; Willis, Handb. Pl. Vict. (1962) 99.

Holotype: Western Australia: Swan River, Drummond (CGE in the Lindley collection).

SYNONYMS: *P. nodosa* Nees in Lehm., Pl. Preiss. II (1846) 105. HOLOTYPE: WESTERN AUSTRALIA: "In arenosis sylvae prope Lime-Kiln, Nov. 1839, Preiss No. 1852". Duplicates of the Type Number have been seen in the herbaria of P, G, L and W. (The specimen under Preiss No. 1852 at Stockholm is an entirely different species, nearer to *P. poiformis* but possibly distinct.) Steud., Syn. Pl. Gram. II (1854) 262; F. Muell., Fragm. VIII (1873) 132; Benth., Fl. Austral. VII (1878) 653; Moore & Betche, Handb. Fl. N.S.W. (1893) 491; Maiden, Man. Grasses N.S.W. (1898) 182; Bailey, Qld. Fl. VI (1902) 1915; Maiden & Betche, Census of N.S.W. Pl. (1916) 25.

P. brizochloa F. Muell. in Trans. Vict. Inst. (1854–5) 45. Mueller cites "On sandhills on the Murray River, Crystal Brook, Rocky River, Tanunda, and other places in South Australia". None of the collections in the Melbourne Herbarium have been labelled *P. brizochloa* by Mueller. As LECTOTYPE I have selected a specimen bearing a pencilled note "In pascuis arenosis ad fl. Murray versus ostium, Oct. 6, 1846, Dr. M"; this sheet bears an additional label reading "*Poa nodosa* Nees, St. Vincents Gulf". However the date on the first label indicates that it was definitely in Mueller's hands prior to publication of *P. brizochloa*. Another specimen at Melbourne labelled "*Poa nodosa* Nees. Murray River. Dr. M.", consisting of a single culm, may be a syntype. At Melbourne there is a third specimen, undated, collected near Tanunda by Mueller, Nov., which is also probably a Syntype. An undated specimen, "Murray, F.Mueller, ex Herb. Hooker" (NSW 38527), may also be part of a Syntype.

P. cognata Steud., Syn. Pl. Gram. (1854) 262. HOLOTYPE: WESTERN AUSTRALIA: Drummond coll. IV No. 589. I have not located this number, but at Kew there is one sheet and at Melbourne two sheets labelled Drummond No. 389; it seems probable that some error in numbering has occurred and that these sheets represent part of the Type material.

Perennial with a shortly creeping, branching rhizome, the tips of its branches developing into culms; some of the lower internodes more or less swollen and nodulose so that there are often 1 to 3 oblong, ovoid or globular nodules subtending the culms. Culms leafy chiefly at the base, 2- to 3-noded above, 25–80 cm. high, erect or geniculate at the nodes, moderately slender, more or less terete, glabrous, smooth and shining, rarely slightly scabrous below the panicle. Nodes glabrous. Sheaths closed towards the base, open above, the upper close around the culm, the lower becoming loose, often purplish-tinted towards the base, the lower usually longer than the internodes, mostly smooth, sometimes lightly scabrous towards the margins. Ligule usually thinly membranous, 2–6 mm. long, from more or less acute to obtuse or truncate, often jagged, smooth or lightly and minutely scabrid on the back. Blades linear, gradually tapering towards the obtuse keeled apex, 8–30 cm. long, 2–4 mm. wide, flat or becoming loosely or closely folded above with slightly incurved margins, deeply furrowed on the upper surface with prominent nerves and scabrous on the ridges, the lower surface also somewhat scabrous. Panicle at length much exserted, with spreading branches or somewhat contracted, more or less lanceolate or subpyramidal in outline, up to 20 cm. long, with few to several whorls of branches, the lowest whorl with 2–5 unequal branches; branches slender to capillary, at length spreading, up to 11 cm. long, usually bare at the base for rather more than half their length, sparsely branched above, tending to fall to one side, together with the pedicels scabrid; pedicels slender, mostly 2–12 mm. long, very slightly enlarged upwards. Spikelets plump, lightly to strongly laterally compressed, lanceolate-ovate when young, very broadly oblong-ovate at maturity, mostly about 7–12 mm. long and 6–10 mm. wide, somewhat pendulous at maturity, greenish or purplish tinted, with 3–8 imbricate florets. Glumes acute to more or less obtuse, 3- to 5-nerved, usually rather broad but much narrower than the lemmas, firmly herbaceous with thinner margins, from almost smooth throughout to variously lightly to rather strongly scabrous on the keels and sides, the lower usually three-quarters to seven-eighths as long as the lowest lemma, the upper about as long to a little longer and broader. Rhachilla segments about 0·6 mm. long, glabrous or remotely hairy. Web usually absent, rarely very slightly developed. Florets very broad, plump and only slightly laterally compressed. Lemma 3–6 (rarely –7) mm. long and about 2·8–3·5 mm. broad when flattened, 5- (rarely 7-) nerved, very obtuse or truncate, scarious at the apex and narrowly so on the upper margins and often with a subapical purplish or brownish band, turgid, keeled, cymbiform, rather abruptly narrowed into the callus at the base, firm, somewhat indurated at maturity, rather densely hairy with somewhat short firm hairs on and between the lateral nerves and margins or only towards the margins, glabrous or hairy on the keel in the lower two-thirds, the back usually glabrous and sometimes sub-shining or occasionally with a few scattered hairs, sometimes slightly scabrous on the back upwards. Palea much narrower than the lemma, oblong or oblong-lanceolate, shorter than to equal to the lemma, minutely to distinctly scabrous on the keels above and smooth below, usually glabrous on the back or occasionally sparsely scabrous-pubescent. Lodicules small, free, thinly membranous, unequally lobed with the outer lobe point-like. Anthers 2·2–3 mm. long, yellow. Ovary turbinate. Grain narrowly oblong-elliptical, shallowly furrowed, more or less 3-angled, free or adhering to the palea at maturity, up to 3 mm. long with the embryo about one-fifth as long. "Knotted Poa", "Shaking Grass" or "Knotted Meadow Grass".

Victoria: Murray River, Mueller (MEL); Swan Hill, Murray River, J.G. Luehmann 1890 (MEL); Lake Boga, H. Bird 11.1903 (NSW 9035; K); Lower Loddon, C. Walter 12.1887 (MEL); Little Desert, Lowan, F.M. Reader 23.10.1898 (MEL).

South Australia: Fowlers Bay, R.S. Rogers 9.1907 (NSW 38537); Fowlers Bay, T. Brown 10.1907 (NSW 38541); Fowlers Bay (AD 95625055); Yalata Station, near Fowlers Bay, J.B. Cleland 24.9.1952 (ADW 7869); Colunna, Fowlers Bay, J.B. Cleland 17.9.1952 (AD); between Fowlers Bay and Eucla, Richards (MEL); Appila, L. Wehl 1884 (MEL); Laura Bay, R.S. Rogers 9.1907 (NSW 38540); near Gladstone, J.M. Black 25.10.1915 (AD); Corny Point, Yorke Peninsula, alkaline sand, D.E. Symon 16.10.1951 (ADW 15158); between Corny Point and Daly Head, Yorke Peninsula, D.E. Symon 9.10.1952 (ADW 8109); between Port Lincoln and Streaky Bay, A.F. Richards 1883 (MEL); Thevenard Peninsula, between Cape Thevenard and Murat, J.M. Black 12.11.1915 (AD); W of Port Lincoln, A. Richards 10.1882 (AD); Forest Range, R. Helms 14.10.1891 (AD).

Western Australia: Drummond (MEL; PERTH); A.G. Hamilton 1902 (NSW 38526, 38532, 38533); A. Morrison 29.10.1904, 5.11.1904 and 12.10.1907 (K); SW Australia, Drummond No. 389, 1848 (K) and No. 398, 1848 (K); Moora, C.A. Gardner 10.1944 (PERTH); Three Springs, F. Stoward 10.1912 (NSW 38534); Abrakurrie Cave, 18 miles NW of Eucla, A.C. Beauglehole No. 13398, 23.9.1965 (NSW 82600); Israelite Bay, Brooke 1885 and 1893 (MEL); Esperance, F.J. Daw 10.1903 (NSW 38542; K; BRI); near Esperance Bay, Dempster (NSW 38536); Esperance Bay, Dempster 1884 (MEL); between Esperance Bay and Fraser's Range, Dempster 1876 (MEL); Fraser Range, R. Helms 14.10.1891 (NSW 38525, 38528; K); Fraser Range, gneissic formation, R. Helms 23.10.1891 (MEL); Bremer River, Webb 1884 (MEL); Bremer Bay, C.A. Gardner 13.10.1942 (PERTH); Bremer River, in granitic sand, C.A. Gardner 2.11.1943 (PERTH); Bremer Bay, J. Wellstead 1900 (K; PERTH) and 12.1919 (NSW 38529); Drummond's track between New Norcia and Toodyay, C.A. Gardner 26.10.1947 (PERTH); Wantadgin district, E.T. Bailey No. 930, 9.1947 (PERTH); Wooroloo, M. Koch No. 1732, 10.1907 (K); Bullsbrook, C.B. Palmer 1930 (K); Yanchep, M. Lindsay 10.1923 (K); Yanchep, Lindsay 10.1933 (PERTH); Northampton, H. Spalding 1883 (MEL); Swan River, Drummond 1839 (K) and No. 169 (K); Lower Swan River, Gribble 1887 (MEL); Cockleshell Gully, red sand, C.A. Gardner No. 8407, 15.10.1946 (PERTH); Bow River, sand hills, S.W. Jackson 11.1912 (NSW 9057; K); Sampson's Brook, G.F. Berthoud 25.10.1902 (K; PERTH); near the Gordon, Oldfield (K); Champion Bay, F. Mueller 10.1887 (MEL); Champion Bay, C. Gray (MEL); Waroona, Nestles Co. Ltd. 15.11.1950 (PERTH); Darling Range, M. Koch No. 1732, 10.1907 (NSW 9036; K); Stirling Range between Warrungup and Ellen's Peak, A. Morrison No. 12020, 16.10.1902 (K; PERTH); Geographe Bay, Irvine (MEL); Geographe Bay, F. Mueller (NSW 38539); Margaret River, J.H. Maiden 10.1909 (NSW 38530); Blackwood River, McHard 1892 (MEL); Karakatta, W.V. Fitzgerald 11.1900 (NSW 38543, 38544); Subiaco, near Perth, A. Morrison 9.11.1909 and 29.10.1910 (K); Darlington, Darling Range, A. Morrison 2.11.1905 (K); Darlington, B.S. Roach 22.10.1949 (AD); among bushes, sandy forest near Fremantle, Oldfield No. 1257 (K); Fremantle, Oldfield (K); North Fremantle, R. Helms 11.1897 (K; PERTH); Claremont, near Perth, C. Andrews No. 1221, 9.1902 and 10.1902 (K); South Perth, W.M. Carne 27.9.1924 (PERTH); near Perth, 11.1893 (NSW 38535); Hamelin Bay, A. Morrison 22.10.1898 (K); South West Bay, Maxwell (K; MEL); 36 miles N of Bunbury, in open forest, M.E. Phillips 21.10.1962 (CBG); King George's Sound, B.T. Goadby 10.1899 (NSW 38538); Porongerup, F. Mueller 1877 (K); Albany, R.M. Lester-Garland 11.1921 (K).

5. P. saxicola *R.Br.*, Prod. (1810) 180; Hook. f., Fl. Tas. II (1858) 125, Pl. CLXIV B; Benth., Fl. Austral. VII (1878) 654; Rodway, Tas. Fl. (1903) 271; Maiden & Betche, Census of N.S.W. Pl. (1916) 25; Willis, Handb. Pl. Vict. (1962) 98.

Holotype: Tasmania: Table Mountain (i.e. Mt. Wellington), R. Brown No. 6286, March 1804 (BM; photograph at NSW). Plate XIII.

Glabrous, densely caespitose perennial with erect shoots from a vertical or oblique rootstock, leafy mostly at the base. Culms slender (very rarely somewhat stout at the base), 25–60 (rarely more) cm. high, terete or somewhat compressed, usually smooth, 1– to 2–noded above the basal leaves. Sheaths firm, usually smooth, occasionally slightly scabrous, compressed, longer than the internodes, open, close around the culms, the lower becoming loose, thin and more or less disintegrating into fibres, not purplish at the base. Ligule firmly membranous, 1–4·5 mm. long, truncate and jagged-ciliate at the apex, often slightly scabrous-pubescent on the back. Blades often more or less expanded when living but, when dry, usually completely and closely folded, mostly 10–25 cm. long, the uppermost leaf often shorter, 2–4 mm. wide when expanded, linear, terminating abruptly in a very short obtuse or acute apex, smooth or somewhat scabrous, striate, either soft and rather thin (chiefly in Tasmania) or rigid and rather thick (chiefly on the mainland). Panicles much exserted, contracted, linear, with short erect branches, about 6–15 cm. long; peduncle smooth to lightly scabrous; branches angular, scabrous, the lower often binate, unequal, bearing few spikelets; lateral pedicels about 1–1·5 mm. long, expanded upwards, scabrous on the angles. Spikelets broadly elliptical, turgid and relatively only slightly laterally compressed, about 7 mm. long, tinted green and purple or gold. Florets 2–4, usually 3, closely imbricate. Glumes broadly ovate and cymbiform, keeled but not strongly compressed, acute or more or less obtuse, minutely ciliolate to finely ciliate on the margins, sparsely scabrous on the keels above, otherwise glabrous, firm with narrow, firmly membranous margins, the lower a little shorter than the adjacent lemma and 1– (or faintly 3–) nerved, the upper a little longer and 3–nerved. Rhachilla segments about 0·5 mm. long, stout, loosely pubescent or glabrous. Callus often with a few short hairs at the front of the lemma, otherwise glabrous. Lemma 4–5·5 mm. long, very broadly ovate, cymbiform, subacute, firm and subchartaceous with narrow membranous margins, faintly shining, 5–nerved, glabrous on the back, slightly scabrous upwards, ciliate on the margins especially towards the base. Palea ovate to lanceolate-elliptical, contracted towards the base, usually shorter than the lemma, firm, glabrous on the back or shortly pubescent upwards, densely ciliate upwards from below the middle on the keel with hairs in more than a single row, smooth below. Lodicules free, thinly membranous, oblong, truncate or unequal-sided or unilaterally pointed. Anthers 0·75–1·5 mm. long, purplish or pale. Grain free from the palea, plump, broadly elliptical, 3–angled, shallowly furrowed, 2–2·5 mm. long and half as broad, the embryo less than one-quarter its length.

In subalpine meadows and herbfields at high elevations in Tasmania, and in the Australian Alps and on Bimberi Range on the mainland.

New South Wales: Snowy Flat near Mt. Gingera, Bimberi Range, ca. 5,300 feet, R. Pullen No. 3832, 27.2.1963 (CANB; NSW 63649); Snowy Flat, Mt. Gingera, J. Vickery 25.1.1964 (NSW 67695); 1½ miles WSW of Mt. Jagungal, 5,280 feet, M. Mueller 3.2.1954 (NSW 38353); Disappointment Spur, Snowy Mts., ca. 5,800 feet, in rock crevice, I. McNeur 28.12.1950 (CANB); near Granite Peaks, N of Mt. Tate, ca. 6,500 feet, A.B. Costin 26.2.1958 (CANB; NSW 45377); below Hedley Moraine, Kosciusko, ca. 6,200 feet, A.B. Costin 1.1958 (CANB); NE slopes of Mt. Northcote, ca. 6,500 feet, A.B. Costin 25.2.1958 (CANB; NSW 45378); Mt. Northcote, ca. 6,700 feet, A.B. Costin 19.1.1963 (CANB; NSW 59134); Kosciusko area, Blue Lake track, 6,100 feet, M. Mueller No. 2932, 4.2.1955 (NSW 38346); near Mt. Kosciusko (NSW 38350);

Mt. Kosciusko, tree-line to 7,000 feet, J.H. Maiden & W. Forsyth 1.1899 (NSW 38352); Mt. Kosciusko, 200 feet below summit in shelter of rocks, H.S. McKee No. 6959, 5.1.1960 (NSW 49921).

VICTORIA: Spion Kopje, Bogong High Plains, A.C. Beauglehole No. 84543, 23.1.1967 (NSW 84543); Watchbed Creek area, Bogong High Plains, A.C. Beauglehole No. 15621 in part, 27.1.1966 (NSW 85570).

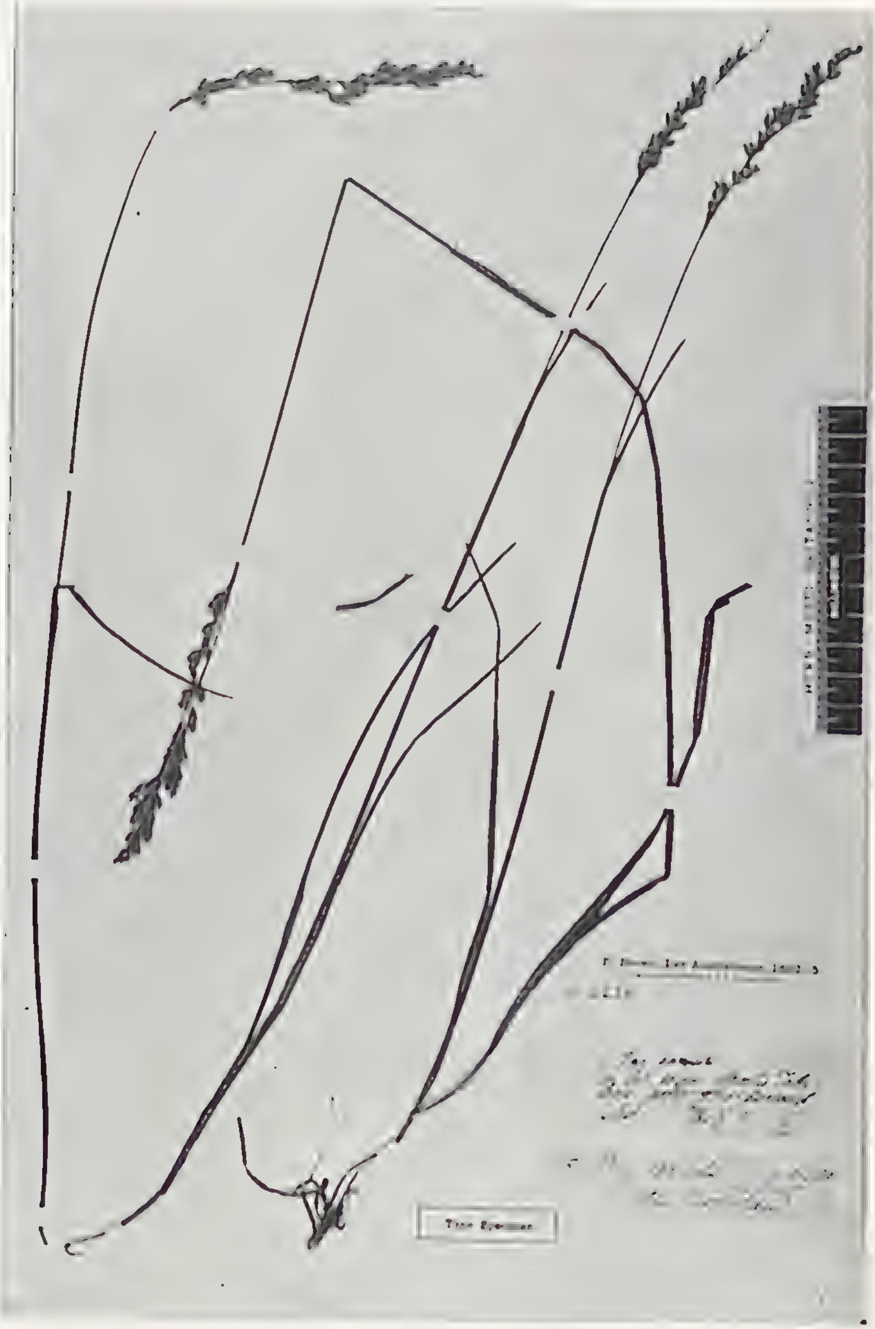
TASMANIA: Cradle Mountain, J. Vickery 28.1.1949 (NSW 38347); slopes of Mt. Field East, J. Vickery 17.1.1962 (NSW 60854); R. Brown, Iter Austral. No. 6280 (K); Mt. Wellington, Gunn No. 1466, 1.3.1839 (K; NSW 38349); Mt. Wellington, Bailey & Shirley 1.1.1892 (BRI; K); L. Rodway No. 2 (MEL); Mt. Wellington, summit, L. Rodway 1.1913 (HO); Mt. Wellington, 4,000 feet, L. Rodway 1.1909 (MEL; K); Mt. Wellington, A.H.S. Lucas 1.1901 (NSW 38348); near Hobart, F.A. Rodway 2.1901 (NSW 39771); Mt. Wellington, J.H. Maiden & R.H. Cambage 1.1902 (NSW 38351); Mt. Wellington, on rocks of summit, J.B. Cleland 2.1915 (AD); Mt. Wellington, 4,000 feet, C.T. White No. 8337, 2.2.1932 (BRI; K); Mt. Wellington, Collinsvale track, W.M. Curtis 7.2.1947 (HO; K); upper slopes of Mt. Wellington, J. Vickery 16.1.1962 (NSW 60853); Mt. Wellington, J. Vickery 16.1.1962 (NSW 60852).

6. P. homomalla *Nees* in Lehmann, Pl. Preiss. II (1846) 104; Steud., Syn. Pl. Gram. (1854) 262; Benth., Fl. Austral. VII (1878) 651.

HOLOTYPE: In solo sublimoso vallis Toodyay valley, March 1840, Preiss No. 1829. A portion of the Type Number has been seen in the National Herbarium, Melbourne, labelled "Swan River, Preiss No. 1829"; it is in a very fragmentary condition, but the strongly compressed, leafy, several-noded culms, conspicuous membranous ligules and small spikelets leave no doubt as to its identity. Another specimen of Preiss No. 1829 is in the Botanical Institute of the Academy of Sciences of U.S.S.R., Leningrad; this is similarly fragmentary, consisting of one panicle from which almost all lemmas have dropped and two leafy culms (one of them with basal sheaths), but the several nodes and leaves, very compressed culms, thin flat leaves and long membranous ligules leave no doubt that it is identical. A third specimen, labelled "Herb. Preiss. 1829. *Poa homamalla* Nees! in Lehm. Pl. Preiss. 2, page 104. Australia", is in the Botaniska Avdelningen Naturhistoriska Rijksmuseet, Stockholm. It consists of about 10 culms but only one over-mature panicle; however in general appearance and vegetative characters it agrees with the preceding.

Culms erect, ascending few or many together apparently from an oblique or creeping, scaly rhizome, or sometimes branching with fascicles of extravaginal shoots from the aerial nodes, 30–75 cm. high, 5– to many– (often 7–) noded, mostly very strongly compressed and 2–sided, leafy and mostly concealed by the sheaths, very faintly to rather strongly scabrous. Leaves all cauline. Sheaths mostly longer than the internodes, very strongly compressed, fused around the culm almost to the orifice, strongly striate, smooth to scabrous, rather thin, the lower becoming rather loose and thinly papery. Ligule often prominent, membranous, short to up to 7 mm. long, obtuse to more or less acute, faintly puberulous on the back below. Blades flat, rather thin, linear, up to 20 cm. long, 1·5–4 mm. wide, shortly narrowed into the keeled apex, slightly auricled at the base, the nerves obscure above, rather prominent below with the midrib and margins slightly thickened, smooth or lightly scabrous on the nerves below and margins. Panicle rather narrow and contracted, 5–20 cm. long, shortly exserted, the branches mostly two together, shorter upwards, the lower 2·5–9 cm. long, all more or less erect and appressed, bare in the lower half and shortly branched above, angular and faintly scabrous; pedicels short or rather short, thick to moderately slender, subsmooth to finely scabrous. Spikelets compressed, 3–5 mm. long, 2– to 6–flowered, sometimes rather crowded, more or less appressed to the branches. Glumes acute, 3–nerved, more or less smooth, about four-fifths as long as the lower lemmas. Web absent. Lemma 2·2–4·5 mm. long, rather prominently 5–nerved, obtuse and scarious at the apex, pubescent on the back and sometimes on the keels in the lower half or glabrous. Palea scabrous on the keels above and finely ciliolate below and pubescent on the back or else both cilia and hairs wanting. Anthers yellow, ca. 1·5 mm. long. Grain not seen. (Nees describes the grain as adherent to the lemma; I have not found this character to be reliable in other Australian species of *Poa*.)

Plate XIII.



Holotype of *Poa saxicola* R. Br. (BM).

Western Australia: Bullsbrook, C.B. Palmer 1930 (K); Swan River, Drummond No. 168C (K); Manjimup, tall growing much branched perennial, in black mud among *Carex* sp., R.D. Royce No. 2981, 25.10.1948 (PERTH); Sampson's Brook, G.F. Berthoud 25.10.1902 (PERTH; K); Serpentine, herb. W.V. Fitzgerald 11.1900 (NSW 9104, 39766, 39767); Marradong, herb. A. Morrison 12.11.1904 (PERTH; K); Deep River, W of Nornalup Inlet, S.W. Jackson 12.1912 (NSW 57754).

A fine-leafed plant in the National Herbarium of Victoria, collected in Western Australia by P. Walcott, although at first sight appearing very different from the specimens cited above, is apparently referable to this species. It shows the very compressed culms, fused leaf sheaths, with some of the leaves flat and slightly auricled at the base, as characteristic in this species.

7. ***P. compressa** *L.*, Sp. Pl. (1753) 69. Noted in the literature of a large part of the temperate world. Figured in C.E. Hubbard, Grasses (1954) 170; Hitchcock & Chase, Man. Grasses U.S. (1951) 106; and in many other works (see Index Londinensis). Recorded for New South Wales by Maiden & Betche in Proc. Linn. Soc. N.S.W. XXXIII (May, 1908) 319 and XXXIV (1909) 366, and for Victoria by Ewart in Vict. Nat. XXIV (April, 1908) 193; see also Willis, Handb. Pl. Vict. (1962) 97–98.

A stiff perennial 10–60 cm. high, spreading by wiry rhizomes, the innovations extravaginal and at first enclosed by broad scales. Culms in loose tufts or scattered, erect or geniculate-ascending, strongly compressed, wiry, smooth or very slightly scabrous, glabrous, 4– to 6–noded, the nodes glabrous. Sheaths strongly compressed and keeled, glabrous, smooth to very slightly scabrous. Ligule membranous, obtuse, glabrous, 0·5–3 mm. long. Blades 2–12 cm. long, 1–4 mm. wide, folded, linear, abruptly narrowed into the keeled apex, usually stiff, glabrous, smooth or more or less scabrous especially on the keel and margins and towards the apex, bluish or greyish green when fresh. Panicles stiff, usually contracted and dense, sometimes more open and loose, narrowly oblong to ovate, 1–10 cm. long and 0·5–3 cm. wide, the branches often very short and bearing spikelets close to their base and, with the short pedicels, smooth or very sparsely scabrous. Spikelets green, yellowish-green or purplish, rather densely clustered, ovate, elliptic or oblong, compressed, 3–8 mm. long, 3– to 10–flowered. Web copious or scanty or absent. Glumes ovate, oblong or elliptic, shortly acute to subobtuse, subequal to a little unequal, 2–3 mm. long, firm except for the rather narrow membranous margins, 3–nerved, smooth on the sides, sometimes minutely scabrous on the keels above. Lemma 2–3 mm. long, narrowly oblong and obtuse in side view, firm except for the narrowly membranous apex, very obscurely 5–nerved, from completely glabrous to softly hairy on the keel and submarginal nerves below the middle or only near the base. Palea finely scabrous on the keels in the upper three-quarters, glabrous on the back. Anthers 1·3–1·5 mm. long. "Canada Blue Grass" or "Flattened Meadow Grass".

Native to Europe and south-west Asia. Naturalised in North America and Australia.

Queensland: Bowen Park (BRI).

New South Wales: Glen Innes Experiment Farm, cult., the Manager 1.1910 (NSW 45374); Guyra, lawn grass found occasionally, E.N. McKie No. 605, 19.2.1931 (BRI); Armidale, in University grounds, L. Whitton 1.1940 (NSW 45370); Nundle, D.F. Sands 31.10.1961 (NSW 56557); Botanic Gardens, Sydney, W.F. Blakely (NSW 45355); Centennial Park, cult. from seed from Blackheath 1.1907 (AD) and 2.1907 (NSW 45373); Centennial Park 3.1909 (NSW 45372); Hawkesbury Agricultural College 20.10.1914 (NSW 60217); Blackheath, W. Forsyth 16.1.1907 (NSW 45375, 45376); Cowra Experiment Farm 3.1912 (NSW 60216); Kiandra, M. Casimir 2.1962 (NSW 60850); Adaminaby, in improved pasture, M. Mueller No. 120, 20.2.1953 (NSW 45345).

Tasmania: Hobart, A.H.S. Lucas 12.1924 (NSW 45371).

The plant figured in Breakwell, Grasses and Fodder Plants of N.S.W. (1923) 159 is not *P. compressa*. The specimen from which it was drawn is too immature for satisfactory determination.

8. P. queenslandica *C.E. Hubbard* in Kew Bull. (1934) 449.

HOLOTYPE: QUEENSLAND: Spring Creek, near Killarney, on mountain slope, in rainforest, at foot of waterfall, amongst basaltic boulders, Hubbard No. 5783, March 1931 (K; duplicate at BRI).

Rather tall, loosely caespitose perennial with a loosely contracted rootstock and extravaginal shoots clothed at the base in broad, thin, distinctly nerved scales. Culms geniculate-ascending or erect or erectly spreading, 50–150 cm. high, relatively stout or sometimes somewhat slender, simple or branched, terete or slightly compressed, glabrous, smooth, 5- to 9-noded, leafy. Nodes glabrous. Sheaths mostly shorter than the internodes, becoming rather loose, striate, glabrous, smooth. Ligule membranous, thin, 2–4 mm. long, truncate and often laciniate. Blades up to 40 cm. long, flat, somewhat thin, 4–15 mm. wide, linear, shortly narrowed into the sheath and somewhat auriculate at the base, gradually tapering to the acuminate tip, green, glabrous, subsmooth to more or less scaberulous on the nerves, the midrib prominent and usually ex-centric, the nerves rather widely spaced. Panicle loose, 12–30 cm. long and up to 16 cm. broad, green, the branches spreading, the lower 5- to 8-nate, unequal, up to 28 cm. long though often much shorter, the spikelets and secondary branches borne mostly above the middle, the rhachis smooth to finely scabrous, the branches and pedicels smooth or minutely scaberulous to lightly scabrous, loosely divided, the lateral pedicels up to 8 mm. long. Spikelets lanceolate or oblong, 3–5 mm. long, loosely 2- to 4-flowered. Glumes obtuse to acute, lightly scaberulous on the keels, rather thin, slightly unequal, about two-thirds as long as the adjacent lemma, the lower lanceolate to ovate, 1·5–2 mm. long, 1- to 3-nerved, the upper ovate to ovate-elliptical, 2–2·2 mm. long, 3-nerved. Web absent. Lemma lanceolate-oblong in outline, obtuse or subacute, 2·5–3 mm. long, prominently 5-nerved with the nerves raised above the surface, rather sparsely and minutely pilose at the very base, minutely scaberulous on the internerves and nerves. Palea about as long as the lemma, minutely scabrous on the keels in the upper four-fifths, scabrous on the back. Anthers 1–1·3 mm. long. Caryopsis 1·8 mm. long.

A large grass found in and on the margins of rainforests in Queensland and New South Wales.

QUEENSLAND: Mt. Mitchell, ca. 3000 feet, C.T. White 4.1950 (BRI); Mt. Mistake, F.M. Bailey 6.1887 (BRI; MEL; K, PARATYPE); Mistake Range, C.T. White 11.1920 (BRI; MEL; K, PARATYPE); Mistake Mountains, ca. 2500 feet, L.S. Smith & L.J. Webb No. 3687, 26.5.1948 (BRI); Mistake Plateau, D.A. Goy & L.S. Smith No. 481, 12.6.1938 (BRI); Northgate, Brisbane, spontaneous in garden, S.T. Blake No. 14312, 2.4.1941 (BRI); near Killarney on Spring Creek Plateau, S.T. Blake No. 13796, 1.5.1938 (BRI); Wilsons Peak, near Killarney, 3200–3750 feet, S.T. Blake No. 13809, 2.5.1938 (BRI); Wilsons Peak, D.A. Goy & L.S. Smith No. 387, 2.5.1938 (BRI); Killarney, F.M. Bailey (BRI); Spring Creek Plateau, 3200–3520 feet, D.A. Goy & L.S. Smith No. 342, 1.5.1938 (BRI).

NEW SOUTH WALES: Acacia Plateau, C.T. White No. 12598, 15.3.1944 (BRI; K; NSW 43213, 43218); Mt. Lindsay, J.L. Boorman 3.1916 (NSW 43220); Tooloom Range, near Urbenville, A.G. Floyd 2.5.1956 (NSW 43206); Gibraltar Range State Forest, 10 miles NE of Glen Innes, 2750 feet, E.F. Constable 24.4.1956 (NSW 37235); Clarence River, Wilcox 11.1875 (MEL); Dorrigo, J.L. Boorman 5.1909 (NSW 43222); on Bellingen to Dorrigo road, near falls, J. Vickery 14.4.1953 (NSW 43211); Oakes State Forest, 20 miles SW of Bellingen, E.F. Constable 18.5.1962 (NSW 64746); Oxley Highway on ascent between Yarras and Yarrowitch, J. Vickery 19.4.1952 (NSW 19401) and M.E. Phillips & J. Vickery 23.2.1961 (CBG 003055); Styx River State Forest, G.E. Battarbee 11.10.1954 (NSW 43209); Gloucester River, below Gloucester Tops, E.F. Constable 17.6.1965 (NSW 78934); Lagoon Pinch, Barrington Tops, 1400 feet, H. Salasoo No.

2423, 29.9.1962 (NSW 58299); Upper Williams River, J. Vickery 1934 (NSW 43216); Williams River, G. Rodway 8.1935 (NSW 43205); Upper Williams River, Salisbury, C.T. White No. 11132, 30.3.1938 (BRI); Salisbury, J. Vickery 1.1930 (NSW 43217; K) and 5.1933 (NSW 43215); Upper Allyn River, L. Fraser 20.8.1929 (NSW 43221); highlands between Gloucester and the Manning River, J.A. McKenzie 3.1909 (NSW 43223); Copeland via Gloucester, R. Robinson 18.4.1941 (NSW 43219); 14 miles NNW of Dungog, R. Story No. 7334, 4.5.1960 (NSW 52883); Cambewarra Mountain, J. Vickery 2.1933 (NSW 43214); Cambewarra, F.A. Rodway 3.1921 (NSW 43208); between Bomaderry and Cambewarra Range, H. Salasoo No. 1331, 12.3.1955 (NSW 43207); Minnamurra Falls, L.A.S. Johnson 23.4.1953 (NSW 43212); Minnamurra Falls, J. Vickery 14.4.1959 (NSW 47105); Kangaroo Valley, E. Gauba 26.3.1952 (CBG 003042; ANU); Berry to Broughton Vale, H. Salasoo No. 1111, 8.3.1954 (NSW 43210).

9. *P. trivialis *L.*, Sp. Pl. (1753) 67. Figured in Hubbard, Grasses (1954) 162, and in numerous other works (see Index Londinensis).

SYNONYMY: For synonymy see Hegi, Illustrierte Flora von Mittel-Europa, Band I (1935) 402; Hitchcock & Chase, Manual of the Grasses of the United States (1951) 944.

Loosely tufted perennial, 20–100 cm. high with extravaginal shoots and creeping leafy stolons. Culms erect, or spreading from a decumbent base, slender to somewhat stout, 3– to 5–noded, smooth, terete or somewhat compressed. Leaves green or purplish, glabrous. Sheaths usually minutely scabrous, rarely smooth, compressed and keeled. Ligule 4–10 mm. long, thinly membranous, acute to acuminate. Blades flat or folded, linear, abruptly narrowed into the sharply pointed apex, 3–20 cm. long, 1·5–6 mm. wide, flaccid or firm, finely scabrous to nearly smooth. Panicle ovate to oblong, erect or nodding, from open and very loose to contracted and rather dense, 3–20 cm. long, up to 15 cm. wide, green, purplish or reddish, the branches mostly in clusters of 3–7, fine, spreading, undivided and devoid of spikelets in the lower part, scabrous. Spikelets ovate to elliptic or oblong, compressed, mostly 3–4 mm. long, 2– to 4–flowered. Glumes acute to acuminate, slightly unequal, minutely scabrous on the keels, the lower lanceolate, 2–3 mm. long, usually 1–nerved, the upper ovate, 2·5–3·5 mm. long, 3–nerved. Web moderately copious, consisting of very long hairs. Lemma 2·5–3·5 mm. long, narrowly oblong, more or less acute, rather markedly dorsally curved, shortly hairy on the keel up to about the middle and otherwise glabrous, distinctly 5–nerved, narrowly membranous on the margins and at the apex. Palea very minutely scabrid on the keels, smooth below, otherwise glabrous. Anthers 1·5–2 mm. long. "Rough Meadow Grass".

Native to Europe, temperate Asia and North Africa, introduced into America and, very sparingly, into Australia.

NEW SOUTH WALES: Muirfield Golf Course, North Rocks, near Parramatta, impurity in *Agrostis* turf, M. O'Reilly 13.12.1966 (NSW 101051); Turner, Canberra, lawn edge, R. Pullen No. 734, 31.10.1957 (CANB); Talmalmo, R.J. Flynn 16.11.1962 (NSW 58297); Albury, in lawn, G.R. Godden 11.1955 (NSW 45570); Woomargama, R.J. Flynn 16.11.1962 (NSW 58296).

TASMANIA: Sandy Bay, garden, W.M. Curtis 12.1948, Kew 197 (HO); Marahoopa Caves, K. Blackwood 16.1.1930 (HO H1182).

10. P. fordeana *F. Muell.*, Fragm. Phyt. Austral. VIII (1873) 130; Moore & Betche, Handb. Fl. N.S.W. (1893) 492; Black, Fl. S. Austral. ed. II (1943) 124; Vickery in Contrib. N.S.W. Nat. Herb. II (1953) 86; Willis, Handb. Fl. Vict. I (1962) 98.

LECTOTYPE: Darling River (lower Darling R.), Mrs Forde (MEL; K). SYNTYPES: Murray River, F. Mueller (K); Wimmera, S. Wilson (MEL); Mount Murchison, Bonney (MEL).

SYNONYMS: *Glyceria fordeana* F. Muell., l.c., in syn.; *Glyceria fordeana* (F. Muell.) Benth., Fl. Austral. VII (1878) 657; Bailey, Qld. Fl. VI (1902) 1916; Turner in Agric. Gaz. N.S.W. IV (1893) 413, figured; Maiden, Man. Grasses N.S.W. (1898) 184; Ewart in Proc. Roy. Soc. Vict., n.s. XXIV (1911) 67; Maiden & Betche, Census of N.S.W. Pl. (1916) 25; Black, Fl. S. Austral. ed. I (1922) 80; Ewart, Fl. Vict. (1931) 166. *Poa caespitosa* var. *flexuosa* F.M. Reader in Vict. Nat. XXIII (1906) 25, nomen. *Poa hackeli* F.M. Reader in Vict. Nat. XXIII (1906) 89, non Post (1897). (SYNTYPES: County of Borung, Reader, several collections, MEL).

Perennial with creeping rhizomes giving rise to shoots singly or in loose fascicles, the rhizomes and lower portions of the shoots clothed with broad, loose, papery scales. Culms often curved and ascending at the base then erect above, sometimes rooting at the lower nodes, 20–100 cm. high, usually simple but occasionally branched from the lower nodes, slender to rather stout, strongly compressed and 2–edged, 3– to many–noded, striate, scabrous. Sheaths (or at least the lower) mostly longer than and concealing the internodes and nodes, entire and tubular in the lower half, open above, strongly compressed and keeled, lightly to strongly scabrous, striate, thin, the lower often much broader than the culm and becoming pale and papery-membranous and ultimately splitting into soft loose fibres, brownish, purplish or pallid. Ligule thin and membranous, glabrous, very rarely slightly scabrous on the back, 1–5 mm. long, obtuse or more or less truncate, often jagged. Blades flat, thin, erect or erectly spreading, linear, gradually tapering upwards to a short, keeled, acute apex, often slightly auricled at the base, 5–30 cm. long, 1·5–4 mm. wide, prominently nerved, usually lightly to strongly scabrous. Panicles at length much exserted, 6–45 cm. long, at first contracted and linear, at maturity narrowly or broadly oblong to pyramidal-acute (up to 20 cm. broad at the base in large panicles) with the branches and spikelets divaricately spreading or somewhat reflexed; rhachis, branches and pedicels more or less angular and scabrous, with evident pulvini at the axils; branching to the second degree on well developed panicles, the primary branches in several tiers, mostly paired, very rarely 3– or 4–nate, short or up to 10 cm. long, with spikelets clustered towards the ends of the branches and not numerous; pedicels 0·5–8 mm. long. Spikelets linear to linear-lanceolate (oblong-elliptical to ovate when expanded), moderately compressed laterally, 3– to 12– (usually 5– to 8–) flowered, 5–11 mm. long, greenish or straw-coloured or sometimes slightly tinted with purple or gold near the apices of the lemmas, the florets loosely imbricate. Glumes herbaceous with more or less membranous margins, narrowly or broadly ovate, acute to obtuse, mostly smooth or sometimes slightly scabrous on the keels upwards, 3–nerved or the upper rarely 5–nerved, subequal or the upper a little longer, the lower two-thirds to seven-eighths as long as the lower lemma. Rhachilla joints about 0·75–1 mm. long, glabrous except for the apical fringe of rather short, straight or woolly hairs (not plicately folded). Web obsolete. Lemma 3·5–5 (often 4) mm. long, keeled, oblong when flattened, 5–nerved with the nerves fairly evident, with membranous margins widest at the apex, very obtuse with the membranous apex sometimes even faintly notched, usually more or less woolly-hairy on the back in the lower part with longer hairs on the keels and at the base of the lateral nerves or rarely the hairs on the internerves obsolescent. Palea at length about as long as the lemma or slightly longer, furrowed between the keels, finely scabrous on the keels above and smooth below, pubescent with fine hairs on the back below or glabrous. Lodicules free, membranous, longer than broad, unequally lobed. Anthers 1·5–2·2 mm. long, narrow, pale. Ovary turbinate. Grain oblong, furrowed, free from the palea.

Inland districts of the south-eastern quadrant of Australia, in more or less wet situations such as swamps, river-flats and drainage channels.

QUEENSLAND: Three miles SE of Blaxland, L.S. Smith & S.L. Everist No. 808, 13.10.1940 (BRI; MEL); Bowenville, F.J. Panek 10.1952 (BRI); Darling Downs, H. Law (MEL; K); Theodore, G. Sewell 9.1952 (BRI); Yelarbon, S.L. Everist No. 917, 19.12.1934 (BRI).

New South Wales: Grey Ranges, 25 miles from Queensland, No. 327 (MEL); Bulloo Flood Waters, Thomson 3.1923 (NSW 38291; ADW 7691); Old Pokataroo, in garden enclosure, J.L. Waterhouse 14.10.1951 (NSW 38294); Moree, J.I.M. Scott 5.7.1906 (NSW 9108); Collymongle, banks of the Barwon River near Collarenebri, E.N. McKie 6.9.1945 (BRI); Tilpa, via Bourke, G. Turner 10.1911 (NSW 13713); Warrego River, E. Betche 12.9.1885 (NSW 13698); Warrego 9.1885 (NSW 38298); Mt. Poole, W. Bäuerlen 11.1887 (NSW 13702); Inverell, E.O. Thomas 11.1912 (NSW 13707); Narrabri, E. Breakwell 10.1912 (NSW 13711); Drildool, Merah North, C. Hearn 19.2.1941 (NSW 13716); Pilliga, H.M.R. Rupp 10.1932 (NSW 13717); Brewarrina, G.G. Darling 31.8.1961 (NSW 56332); Coonamble, E. Breakwell 11.1912 (NSW 13708, 13710); Coonamble, T.P. Fagan 29.10.1963 (NSW 63743); 7½ miles S of Gunnedah, on low-lying wet places, fescue-like tussocks, F. Hely 11.1949 (NSW 13722) and 1.1950 (NSW 13718); Coolabah, R.W. Peacock 10.1900 (NSW 13704); Coolabah, per Nyngan Demonstration Farm 5.1914 (NSW 60212); Girilambone, T.E. Grigg 9.1912 (NSW 13697, 38303) and 3.1913 (NSW 13696); Nyngan, R. Helms 11.1893 (NSW 38297); Nyngan, A.D. Forbes 16.9.1949 (NSW 13721); Nyngan, W.F. Blakely 10.1912 (NSW 38300); Kembah (?Kember), C.G. McCapp 9.1908 (NSW 38301); 22 miles on Menindie Road, A. Morris 9.9.1921 (NSW 9107, 38290; ADW 7672, 7673); Wandobah, Curlewis, W.D. Simson (NSW 60219); Nombi, Liverpool Plains, S. Browne 11.1908 (NSW 13712); Trangie, R.D. Whalley 12.9.1958 (NSW 46013); near Trangie, L.R. Clark No. 22 (CANB); Nevertire, R. Helms 11.1892 (NSW 13706, 31317); Condobolin 1894 (NSW 38295); Condobolin, W.T. Kidston 1894 (NSW 13700); Boyd, N.C. Beadle 1942 (NSW 13709); Grenfell 2.1901 (NSW 38292); Grenfell, H. Palazzi 8.9.1939 (NSW 38304); Trida, between Roto and Ivanhoe, R.W. Condon 19.10.1954, from a "Cane Grass" area subject to occasional swampy conditions (NSW 38293); near Mossgiel, N.C. Beadle 8.1942 (NSW 38305); Lachlan River, A. Cunningham 5.1817 (K, cited by Bentham as *Glyceria ramigera*); Lachlan River, F. Mueller 9.1878 (MEL); between the Lachlan and Darling Rivers, G. Drysdale 1892 (MEL); River Darling, near water (MEL); between the Darling and Lachlan Rivers, J. Brückner 8.1885, 9.1885 and 10.1885 (MEL); Darling River, Woolls (NSW 13703); Darling River (BRI); Barellan, G. Rudd 20.7.1939 (NSW 39299); Gunning Gap, B. Whitehead 3.11.1963 (NSW 67678); Murrumbidgee River, F. Mueller 9.1878 (MEL); Murrumbidgee, G. Day (MEL); Faulkner Memorial Field Station, O.B. Williams 10.1947 (CANB 14564; K); Jerilderie district, Riverina, J. Dykes Nos. 54 and 75, ca. 1880 (NSW 13715); Yanco, J.N. Whittet 11.1922 (NSW 60220); Leeton, per Rice Research Station 10.1938 (NSW 38303); NE Hay, J.H. Leigh 26.9.1963 (NSW 63680); Zara, via Hay, E. Officer 2.1904 (NSW 38296); 15 miles NE of Deniliquin, J.H. Leigh 9.9.1963 (NSW 63671); Tulla, D.L.W. Henderson No. 115, 30.9.1945, not plentiful, mostly in shelter of fallen heads of trees in friable grey silt humus soil on natural levee bank of Wakool River, stoloniferous spreading patches, not tussocky (NSW 13720) and No. 115a, 1945, more or less in shade on flats and edges of dryish swamps (NSW 13719); Curlwaa, R.E. Lord 9.1913 (NSW 13705).

Victoria: River Murray, R. Tate (MEL); Swan Hill, Gummou (MEL); junction of Murray and Darling Rivers, Holding 1889 (MEL); Kulkyne National Park, E side of Lake Hattah, A.C. Beauglehole No. 7185, 3.10.1960 (NSW 82604); between Waaia and Nathalia, Goulburn Valley, in swampy depressions along the railway line, J.H. Willis 10.10.1932 (MEL); Nine Mile Swamp (probably near Kerang), E.J. Semmens 9.1921 (MEL; K); Echuca (MEL); County of Borung, F.M. Reader 30.10.1901 (MEL, 4 sheets) and 24.10.1901 (MEL); Mallee district near Nhill, C. Walter 11.1887 (NSW 13701); Merwyn's Swamp near Kaniva, A.J. Hicks 9.1950 (MEL); Daylesford, R. Wallace 1878 (MEL).

South Australia: Coopers Creek, the principal grass on flooded country, MacGillivray 10.1920 (NSW 13714); Coopers Creek, MacGillivray 10.1923 (ADW 7676, 7677); Cooper to Paralina, Northern Flinders Range (AD); near Lake Frome, herb. J.M. Black (AD); Buckland Park, H.C. Trumble 26.11.1937 (ADW 3801); Corona, near Iron Knob, Eyre Peninsula, W.L. Cleland 6.1885 (AD; K); Morgan, clay flats, Murray Mallee, 8.9.1883 (AD).

11. *P. pratensis *L.*, Sp. Pl. (1753) 67. Figured in C.E. Hubbard, Grasses (1954) 166; Breakwell, Grasses and Fodder Plants of N.S.W. (1923) 155, and in many other works (see Index Londinensis). See also Gardner, Fl. West. Austral. I. Gram. (1952) 107, t. 31; Willis, Handb. Pl. Vict. I (1962) 97–98. For synonymy see Hitchcock & Chase, Manual of the Grasses of the United States, ed. II (1951) 943.

I am treating this species in the broad sense, and so as to include *P. angustifolia* L. The latter is regarded as a distinct species by some authors (e.g. Hubbard, l.c.) and as a subspecies or variety of *P. pratensis* by others. In this broad sense *P. pratensis* includes numerous races and strains, some of which have been accorded taxonomic status, e.g. see Hegi, Illustrierte Flora von Mittel-Europa ed. II, Band 1 (1935) 403–405, and Jansen in Flora Neerlandica, Gramineae (1951) 82–83. Some of the strains are known to reproduce sexually, others are apomictic, i.e. able to produce viable seed without fertilization. Although some variation is displayed in the Australian collections it has not been deemed practicable at present to apply any system of segregation amongst them nor even to distinguish any recognisable population as *P. angustifolia* on the characters used by Hubbard to differentiate it in British material. Some Australian specimens appear to agree with British collections of *P. angustifolia* identified by him but many others appear to fall between these and the broader-leafed forms of *P. pratensis*.

Variable perennial, 10–90 cm. high with slender creeping rhizomes bearing pointed scale leaves, with extravaginal innovations, forming loose to compact tufts or turf. Culms erect, or geniculate at the lower nodes, slender to relatively stout, usually terete but occasionally more or less compressed, smooth, 2- to 4-noded, the nodes glabrous. Leaves often rather dark-green. Sheaths smooth, compressed, the lower keeled, glabrous or minutely hairy or scaberulous, often puberulous at the orifice. Ligule membranous, glabrous or minutely pubescent or scabrous on the back, 1–3 mm. long, very obtuse or truncate, sometimes jagged but not or very obscurely ciliolate at the apex. Blades linear, flat or folded, from very short to up to 30 cm. long, 1–4 (rarely –6) mm. wide, abruptly narrowed into the keeled, pointed or blunt tip, smooth to slightly scabrous especially towards the apex on the keel and margins, smooth or sprinkled with short hairs on the upper surface. Panicle ovate to pyramidal or oblong, erect or somewhat drooping, contracted and rather dense to open and moderately loose, the branches usually moderately short, mostly 1–5 (rarely –10) cm., capillary, unequal, spreading, scabrous, often flexuose. Spikelets ovate to oblong, somewhat compressed (but usually less strongly flattened than in most of the native Australian species), 2·5–6 mm. long, 2- to 5-flowered, usually green, more rarely slightly purple-tinted. Glumes acute to acuminate, unequal, rather sparsely scabrous on the keels above, smooth on the sides, moderately broad, the lower 1·5–3·5 mm. long, 1- to 3-nerved, the upper 2–4 mm. long, 3- to 5-nerved. Web copious, consisting of long, fine, crinkled hairs. Lemma 2–4 mm. long, acute to somewhat obtuse, oblong to ovate-oblong in side view, herbaceous and not indurated, thinly to densely hairy on the keel and marginal nerves up to about the middle, finely but distinctly 5-nerved, with hyaline tips and margins. Palea scabrous on the keels, glabrous on the back. Anthers 1·5–2 mm. long. "Kentucky Blue Grass".

Naturalised over a wide area in southern Australia, but thrives best in the cooler and moister districts, and prefers rich soils. Commonly planted in lawn-grass mixtures especially for sportsfields. Useful as a fodder grass in those districts which suit it. Native to Europe and Asia, now widely distributed in temperate regions.

Queensland: Biggenden State Farm 3.10.1906 (BRI); Laverton, S.T. Blake No. 345, 5.1.1933 (BRI); Bald Mountain, near Wallangarra, M.S. Clemens 9.11.1944 (BRI).

New South Wales: Acacia Plateau, N. Vane 13.11.1961 (NSW 56533); Clouds Creek via South Grafton, K.A. Kirby 8.11.1949 (NSW 45416); Dundee, per A. Yates & Co. 11.1908 (NSW 45431); Glen Innes Farm, the Manager 10.1912 (NSW 45450); Inverell, M.V. Miles 28.10.1957 (NSW 45447); Parlour Mountains, Booralong area, ca. 25 miles NW of Guyra, M. Gray No. 1824, 20.10.1952 (CANB; NSW 45404); Armidale, F.A. Rodway 4.10.1939 (NSW 45427); Thalgarra, 10 miles from Armidale, R.J. Millington 9.10.1949 (NSW 45455); Nundle, D.F. Sands 31.10.1961 (NSW 56437); Bathurst Experiment Farm, Peacock 11.1910 (NSW 45435); Bathurst, W.H. Webb 10.1910 (NSW 45398); Bathurst Experiment Farm, E. Breakwell 10.1912 (NSW 45396), 1.1913 (NSW 45481) and 19.12.1913 (NSW 45568); Sunny Corner, J.L. Boorman 11.1899 (NSW 45418); Meadow Flat, at Portland turn-off, C.K. Ingram 21.10.1958 (NSW 47177); cult. at Botanic Gardens, Sydney, from turf from Berridale district, E.A. Scarlett

17.9.1948 (NSW 45437); Governor's Domain, Sydney, J.H. Camfield 10.1902 (NSW 45442); Botanic Gardens, Sydney, E. Cheel 1912 (NSW 45406, 45409, 45410, 45411) and 1.1913 (NSW 45395); Sydney University Grounds, J. Vickery 24.9.1930 (NSW 45408) and 4.1931 (K; BRI); Botanic Gardens, Sydney, W.F. Blakely 1.1913 (NSW 45481), 19.12.1913 (NSW 45568) and 4.1914 (NSW 45392); Bellevue Hill, F.A. Rodway 16.10.1937 (NSW 45441); Centennial Park, J. Nichol 10.1912 (NSW 45482); Homebush Bay, J. Vickery 29.9.1929 (NSW 45458); Kogarah, J.H. Camfield 11.1899 (NSW 45415) and 10.11.1902 (NSW 45402); Hawkesbury Agricultural College, Richmond, W.M. Carne 8.11.1900 (NSW 45400) and C.T. Musson 11.1912 (NSW 45448, 45449, 45452); Berry, F.A. Rodway 17.11.1932 (NSW 45426); Nowra, R.H. Anderson 11.1934 (NSW 45428); Nowra, F.A. Rodway 10.1928 (NSW 45440) and 9.11.1930 (NSW 45425); Braidwood, K. Macdonald 7.10.1944 (NSW 45407); Braidwood district, W. Bäuerlen No. 188, 12.1886 (K; MEL); Yattayatta, near Milton, F.A. Rodway 15.10.1930 (NSW 45424); at foot of Black Mountain, A.C.T., E. Gauba 5.11.1952 (CBG 003397; ANU); Canberra, E. Gauba 23.11.1956 (CBG 003396; ANU); Turner, Canberra, Pullen No. 737, 31.10.1957 (CANB; NSW 57298); Tumbarumba, J.W. Cunningham 10.1904 (NSW 45484); Happy Jacks Plain, headwaters of Happy Jacks River, ca. 15 miles S of Kiandra, M.E. Phillips 20.12.1954 (NSW 45588) and J. Vickery 18.1.1958 (NSW 45399); Teddy's Creek (tributary of Gunjartin River), M.E. Phillips & J. Raeder-Roitzsch 8.1.1957 (NSW 45480); Mt. Erin, Wagga 1.12.1934 (NSW 45443); Tilba Tilba, E. Breakwell 12.1913 (NSW 45397); Bodalla, R.J. Flynn 12.11.1948 (NSW 45451); Nadgee, via Eden, W.R. Newton 12.1913 (NSW 45403); Bega, per Glenfield Veterinary Research Station 9.11.1938 (NSW 45401); Nimitybelle, 10.1896 (NSW 45419); Griffith, G.R. Sainty 25.10.1966 (NSW 94291); Albury, T.H. Patterson 10.1916 (NSW 45413); Albury Botanic Gardens, E.J. McBarron No. 3838, 19.10.1949 (NSW 45483); Albury, R.J. Flynn 9.10.1961 (NSW 56331); Cunninyenk, D.L.W. Henderson No. 185, 6.10.1946 (NSW 45459).

VICTORIA: Corryong, Upper Murray, T. Lang (MEL); The Domain, Melbourne, T.B. Muir No. 512, 14.10.1958 (MEL; NSW 85366).

TASMANIA: Hobart, A.H.S. Lucas 12.1914 (NSW 45429); Hobart, F.A. Rodway 1.1901 (NSW 45421); Hobart, L. Rodway No. 1181, 30.10.1929 (HO); Domain, L. Rodway No. H1181, 11.1928 (HO); University, Domain, W.M. Curtis 16.10.1943 (HO; K); Mt. Wellington, S.T. Blake No. 18266, 13.1.1949 (BRI; NSW 57135); Blackmans Bay, F.A. Rodway 22.11.1935 (NSW 45423); Lenah Valley, 750 feet, D. Martin 14.11.1937 (NSW 45430); Cygnet and Huon Valley, D. Martin 1934 (NSW 45405); Gordon River, F.A. Rodway 11.1898 (NSW 45420).

SOUTH AUSTRALIA: Meningie, L.D. Williams 10.1946 (LDW); Brougham Place Reserve, North Adelaide, J.M. Black 11.10.1922 (AD); Brougham Place Gardens, J.M. Black 3.12.1941 (AD); Palmer Place, North Adelaide, J.M. Black 8.11.1921 (AD); Montefiore Hill, J.M. Black 10.10.1937 (AD); Adelaide Botanic Park, J.B. Cleland 11.1948 (AD); Hackney Road, near Adelaide, J.B. Cleland 13.11.1943 (AD); Beaumont, J.B. Cleland 14.11.1943 and 28.11.1948 (AD); Forest Range, J.B. Cleland 16.11.1946 (AD); Montacute, J.M. Black 6.11.1939 (AD); Callendale, R.L.C. 27.10.1945 (ADW); Uraidla, J.B. Cleland 20.11.1943 and 18.12.1943 (AD); Mt. Lofty station, J.B. Cleland (AD); Encounter Bay, J.B. Cleland 1.1944 (AD); South East 1.1930 (ADW 504); Millicent, J.M. Black 4.12.1917 and 5.12.1917 (AD); Blue Lake, Mt. Gambier, J.M. Black 26.11.1917 (AD); Robe, J.M. Black 10.1910 (AD); Port MacDonnell, J.B. Cleland 1.11.1941 (AD).

WESTERN AUSTRALIA: Manjimup, W.M. Carne 19.12.1923 (PERTH); Manjimup, F. Stoward (K); Busselton, H. G. Elliott 13.11.1945 (PERTH).

12. P. tenera *F. Muell. ex Hook. f.*, Fl. Tas. II (1858) 124, t. 164; J.H. Willis, Handb. Pl. Vict. (1962) 96–97.

HOLOTYPE: TASMANIA: R.C. Gunn No. 1009, 13.12.1837 (K; duplicate NSW 39121).

SYNONYMS: *P. saxicola* ?var. *effusa* Nees in Hook. Lond. Journ. Bot. II (1843) 48, based on R.C. Gunn No. 1009 (CGE in the Lindley collection); *P. effusa* (Nees) Steud., Syn. Pl. Gram. (1854) 262, non *P. effusa* Kit. (1814;) *P. caespitosa* var. *tenera* (F. Muell.) Benth., Fl. Austral. VII (1878) 653; *P. humifusa* J.M. Black in Trans. Roy. Soc. S. Austral. LXVI (1943) 248, (LECTOTYPE: Caroline Scrub, SE of Mt. Gambier, J.M. Black 29.11.1917 (AD 95627011; duplicate MEL)).

Green, flaccid, trailing perennial, or sometimes forming tussocks, with long (stated by Hooker to be 1–8 feet long), very slender, many-noded, branching, stoloniferous stems which may produce one to several extravaginal or intravaginal shoots in fascicles at the nodes, usually growing in woods or other shaded places such as amongst rocks. Shoots (or some of them) at first enclosed in delicate, subhyaline, broad, obtuse scales (cataphylls). Internodes puberulous or scabrous to smooth. Culms very slender and weak. Sheaths becoming loose, thin, smooth or slightly scabrid, usually pallid or green, rarely purplish. Ligule firmly membranous, 0·5–1·5 mm. long, truncate, often scabrid on the back. Blades often flat, linear, about 1–1·5 mm. wide when expanded, or sometimes folded or inrolled-angular and more or less filiform and then about 0·1–0·5 mm. diameter, usually smooth, or scabrid on the outer surface, often minutely scabrous-pubescent on the inner surface, 5–20 cm. long, shortly pointed. Panicle 2–12 cm. long, at length delicately spreading with filiform branches bearing few spikelets towards their apices, the lower "whorl" of branches 2- to 6-nate, the branches undivided and devoid of spikelets in the lower half to two-thirds and, together with the pedicels, very finely and delicately scabrous. Spikelets compressed, 2- to 4-flowered, green or rarely purplish, oblong to ovate, usually small. Glumes thin and rather delicate, rather variable in shape but often broad and cymbiform, acute to obtuse, entirely smooth or very slightly scabrous on the keels, unequal with the upper a little longer and broader, the lower 1- to 3-nerved, the upper 3-nerved, often only half as long as the adjacent lemma. Web often obsolete. Lemma 2–3 mm. long, obtuse, oblong to oblong-lanceolate, distinctly 5-nerved, thin, minutely pubescent on the internerves, nerves and margins in the lower part or quite glabrous. Palea usually very delicate, very finely scabrous on the keels above, extremely finely ciliolate below or these cilia obsolete, finely pubescent to glabrous on the back. Anthers about 1–1·5 mm. long.

Tasmania and southern mainland of Australia, preferring shady and moist but well drained situations.

NEW SOUTH WALES: A. Cunningham 1824 (K); Wellington Valley, A. Cunningham No. 105, 11.1825 (K); Devil's Hole, Towac, 7 miles SW of Orange, growing on crevices on rock face, 3400 feet, E.F. Constable 8.10.1960 (NSW 52952); Cox's Gap, ca. 20 miles WSW of Sandy Hollow, E.F. Constable 10.8.1962 (NSW 57946); Currant Mountain Gap, near Olinda, E of Rylstone, J. Vickery 14.2.1966 (NSW 101037); Nattai River, E. Cheel 29.10.1912 (NSW 9053; K); Jenolan Caves, hanging from steep banks and cracks in rocks, C.K. Ingram No. 100, 20.10.1962 (NSW 58967); Gibraltar Creek area, Paddy's River district, eucalypt woodland on granite hillside, ca. 3000 feet, R. Pullen No. 3697, 21.11.1962 (CANB; NSW 63655); Lob's Hole, M.E. Phillips & J. Raeder-Roitzsch No. 3625, 8.12.1959 (NSW 48989).

VICTORIA: Weeragua, Upper Cann Valley, N.A. Wakefield No. 2124, 20.11.1947 (NSW 39122; NAW); Bluenose Creek, Cann River, stems branching extensively amongst undergrowth, N.A. Wakefield 24.11.1947 (NSW 39123); Cann River, N.A. Wakefield Nos. 2107, 2108, 24.11.1947 (NSW 39124, 46143; NAW); Reedy Creek, Cann River, N.A. Wakefield No. 2113, 13.11.1947 (NSW 46144); East Gippsland, F. Robbins ca. 1937 (ACB 7418; NSW 85579); Bastion Point, Mallacoota, T.B. Muir Nos 1891, 1892, 25.11.1960 (MEL; NSW 85370, 85552); N of Betka River, near Mallacoota, sandy soil of coastal heathland, N.A. Wakefield & J.H. Willis 23.10.1948 (MEL); Nightingale Creek, just above Tali Karng, T.B. Muir No. 2952, 31.12.1963 (MEL; NSW 85369); Welshpool, Howitt (MEL); Orbost, C.H. Grove 2.1905 (NSW 39127; K; MEL); Yarragon, A. Howitt No. 984 (MEL); Black Forest, F. Mueller 12.1852 (MEL); Riley's Creek Gorge, Brisbane Ranges, forming soft stoloniferous tussocks amongst rocks at base of high cliffs, ca. 2 miles above mouth of gorge at Staughton Vale, J.H. Willis 22.10.1955 (MEL); Western Head of Watson's Creek, immediately S of Mt. Everard, Kinglake National Park, on moist earth in the shade of dense gully vegetation, J.H. Willis 3.12.1944 (MEL; K); Mt. Dandenong, R.A. Oxenford 4.12.1948 (NSW 39126); Narree Warren, J. Staer 4.1911 (NSW 39530); Fern Tree Gully, H. Salasoo No. 1741, 2.1.1959 (NSW 47049); Ballarat, Bacchus No. 94 (MEL); Wandin, P.R.H. St. John 16.11.1906 (MEL; K); Lower Glenelg National Forest, far SW Victoria, above Morton's Huts in the SW of Warrain Parish, forming tussocks but, with increasing shade and moisture, bearing long stolons which creep over the damp earth, J.H. Willis 29.10.1948 (MEL); Grampians, Mt. William, A.C. Beauglehole No. 22216, 14.11.1966 (NSW 101085); Swan Lake, W of Portland, A.C. Beauglehole No. 7700, 1.1946 (ACB).

TASMANIA: Archer (NSW 9052; K); Stuart (MEL); Van Diemen's Land, R.C. Gunn No. 1009, ex Lindley's herbarium 1878 (K); George's town, 967 (MEL); River Mersey, 530, F. Mueller (MEL); Launceston, R.C. Gunn 14.12.1844 (K); Penquite, R.C. Gunn No. 1491, 12.1845 (K; NSW 85555); 20 miles inland from Queenstown, ca. 1400 feet, in deteriorated "Button Grass" plain, M.E. Phillips 24.1.1962 (CBG 003065; NSW 57036); Brown Marsh Creek, near Bronte, ca. 2000 feet, in disturbed "Button Grass" community, M.E. Phillips No. 294, 22.1.1962 (CBG 003066; NSW 57041); Honeywood, Blyth 1874 (MEL; K); Gardener's Bay, roadside, W.M. Curtis 12.1943 (HO; K); Shipwright's Point, S. Huon, bushy places, Oldfield Nos. 113, 115 (K); rocky places by the Kermandrie, in bushes, the lower parts very thick (about 1 foot through), the flowering branches climbing over bushes 3–4 feet high, Oldfield No. 110 (K); Bramble Cove, Port Davey, C. Davis 9.2.1937 (NSW 57035); Lune River district, amongst undergrowth in dense coastal scrub, J. Vickery 20.1.1962 (NSW 57034; CBG 003064); 2 miles SE of Hastings Caves Reserve, N.T. Burbidge No. 3157, 15.1.1949 (CANB; HO; K); Southport, No. 1568, 12.1855 (MEL); Southport, No. 1566 (MEL); Southport, No. 1465, 1.1856 (MEL; K); Southport, C. Stuart No. 1571, ca. 1857 (MEL; K); Southport, No. 1564, 12.1855 (MEL); Southport, C. Stuart (K).

SOUTH AUSTRALIA: Montacute, J.B. Cleland 21.10.1944 (AD); Clarendon, sea beach near Morphett-vale, 15 miles SW of Adelaide, O. Tepper No. 1110, 12.11.1882 (K; MEL); Hundred of Caroline, J.M. Black 5.12.1917 (AD); Eight Mile Creek, Tea-tree thicket by Evans Ponds, C.M. Eardley 3–4.2.1942 (ADW 4981); Keith, J.M. Black 23.11.1917 (AD) SYNTYPE OF *P. humifusa*; near Beachport, on fringe of a thicket of *Leptospermum pubescens*, near a natural drain, L.D. Williams 25.5.1957 (AD); Blanche State Forest, Mt. Gambier, J.B. Cleland 28.5.1928 (AD); Callawonga Creek, Fleurieu Peninsula, F.M. Hilton 25.11.1953 (ADW 19038); Kangaroo Island, North East River, G.H. Clarke 12.1936 (ADW 2515); Kangaroo Island, Stunsail Boom River, J.B. Cleland 24.11.1945 (AD); Kangaroo Island, Rocky River, J.B. Cleland 24.11.1945 (AD); Kangaroo Island, between Kingscote and Rocky River, J.B. Cleland No. H.139, 17.11.1924 (BRI); Flinders Island, J.B. Cleland 11.1912 (NSW 39125, 39531).

Some difficulty has been experienced in comprehending the limits of *P. tenera*, and there is no doubt that further field studies are required. Its spikelets are very similar to those of *P. sieberana* and the group of related species. Collectors' notes show that it may display a tussocky phase as well as producing stolons. Unless the stolons are included in the collection, as has frequently not been done, there is inevitably some uncertainty as to the habit of the plant represented on the herbarium sheet and hence its identity. The slender smooth leaves and distinctly membranous ligules provide supporting characters, but collectors should endeavour to provide material which demonstrates any tendency to development of stolons or clusters of aerial shoots when these are present on the tussock.

13. **P. affinis** *R. Br.*, Prod. (1810) 179.

HOLOTYPE: R. Brown No. 6287, Iter Australiense 1802–5 (collected at Port Jackson, New South Wales), (BM; duplicates at K; photograph at NSW). Plate XIV.

SYNONYM: *P. caespitosa* Forst. var. *affinis* (R. Br.) Benth., Fl. Austral. VII (1878) 652.

Densely or somewhat loosely caespitose, leafy perennial, with the innovations mostly extravaginal from a contracted rootstock and sometimes bearing obtuse scales at the base, rarely rhizomatous, the shoots simple or often branched and occasionally developing into trailing stolons. Culms moderately slender, slightly compressed, smooth, leafy and many-noded in the lower half, mostly 40–120 cm. high. Nodes glabrous. Sheaths often longer than the internodes, keeled and compressed upwards, becoming loose, glabrous, smooth or slightly to densely minutely scabrid. Ligule membranous, 0·5–2 mm. long, truncate, finely laciniate to minutely ciliolate, puberulous on the back. Blades flat, 1–5 mm. wide, 10–30 cm. long, linear, gradually narrowing into the short, acuminate, keeled tip, rather thin, not rigid, glabrous, often finely scabrous on the margins, prominently nerved below and minutely scabrid on the nerves or almost smooth, the upper surface smooth to finely scabrous or minutely pubescent. Peduncle smooth or faintly scabrous below the panicle, terete or slightly compressed. Panicle at length much exserted, up to

18 cm. long, somewhat contracted or spreading, the lowest whorl of branches 2– to 6–nate, the branches unequal with the longest up to 12 cm. and bearing the secondary branches and spikelets mostly in their upper half, the main axis striate and smooth on the nerves but minutely scaberulous between them, the branches and pedicels elongate, slender and finely scabrous. Spikelets lanceolate, 2– to 7–flowered, green or slightly purplish-tinted. Glumes ovate, acute, rather broad, unequal, the lower 1– to 3–nerved, the upper 3–nerved, finely scabrous on the keels, about half to three-quarters as long as the adjacent lemma. Web moderately copious to scanty or occasionally absent. Lemma distinctly 5–nerved, 2·7–3·6 mm. long, obtuse or subacute, loosely to closely pubescent on the back in the lower half with slightly longer hairs on the keel, lateral nerves and margins. Palea minutely scabrous on the keels above and very finely ciliolate at about the middle third, smooth towards the base, finely pubescent on the back. Anthers 1·75–2·25 mm. long.

Chiefly on the Central Coast of New South Wales, extending occasionally to the Central Western Slopes.

NEW SOUTH WALES: A.H.S. Lucas 14.11.1916 (NSW 43248); Growee Gulf Road, Bylong, C.K. Ingram 27.12.1960 (NSW 53488); Munghorn Gap, 21 miles NE of Mudgee, C.K. Ingram 27.2.1960 (NSW 50284); Pulbah Island, Lake Macquarie, E. Cheel 24.11.1929 (NSW 43255, 43256); Gosford, J. Vickery No. 82, 23.11.1930 (NSW 43240; K; BRI); Gosford, J.L. Boorman 1.1903 (NSW 43238); Kincumber, L.A.S. Johnson 24.11.1959 (NSW 48846); Hawkesbury, H. Deane 10.1884 (NSW 43254); Narrabeen, J. Vickery 9.11.1935 (NSW 43235); Hornsby, Junction Road, W.F. Blakely 11.1913 (NSW 43253); Pennant Hills, L. Fraser 28.12.1959 (NSW 48982); Beecroft, L.A.S. Johnson 13.12.1945 (NSW 43251); Cheltenham, J. Vickery 23.12.1947 (NSW 43257); Manly, H. Deane 11.1885 (NSW 9044, 43241; K); Neutral Bay, J.B. Cleland 12.1912 (NSW 43247; AD 95626003); Neutral Bay, E. Cheel 19.12.1912 (NSW 9046; K); Sydney, J.B. Cleland (NSW 43236); The Spit, Middle Harbour, Sydney, J.B. Cleland 11.1914 (AD 95625092, 95625093); Hunters Hill, W.M. Carne 11.1912 (NSW 43242); between Hunters Hill and Drummoyne, C. Barnard (CANB); Woolloomooloo Bay, J.H. Camfield 17.11.1902 (NSW 9045; K); near Watsons Bay, Port Jackson 12.1885 (NSW 43237); Parramatta, W. Woolls ca. 1860 (K); Parramatta, moist places, W. Woolls (MEL); Kurrajong Heights, J. Vickery 23.11.1958 (NSW 46186); Kurrajong Heights, H. Salasoo 27.12.1956 (NSW 43349); Liverpool, O.D. Evans 7.12.1925 (SYD); Hurstville district, J.H. Camfield 11.1.1903 (NSW 43252); Cooks River, E. Breakwell 11.1914 (NSW 43239); Oatley Bay, J.H. Camfield 2.11.1902 (NSW 43250); Kogarah, J.H. Camfield 11.1893 (NSW 43249); Mortdale, J.H. Camfield 20.12.1902 (NSW 43243); Blakehurst, E. Bennett 11.11.1944 (NSW 9043; K); Lugarno, Georges River, J. Vickery 4.1931 (K; BRI); Herne Bay, Georges River, J. Vickery 9.11.1930 (K; BRI); National Park, S of Audley, tussocks with long leafy stems and stolons trailing over rocks in relatively dry sandstone forest, J. Vickery 15.12.1956 (NSW 43246).

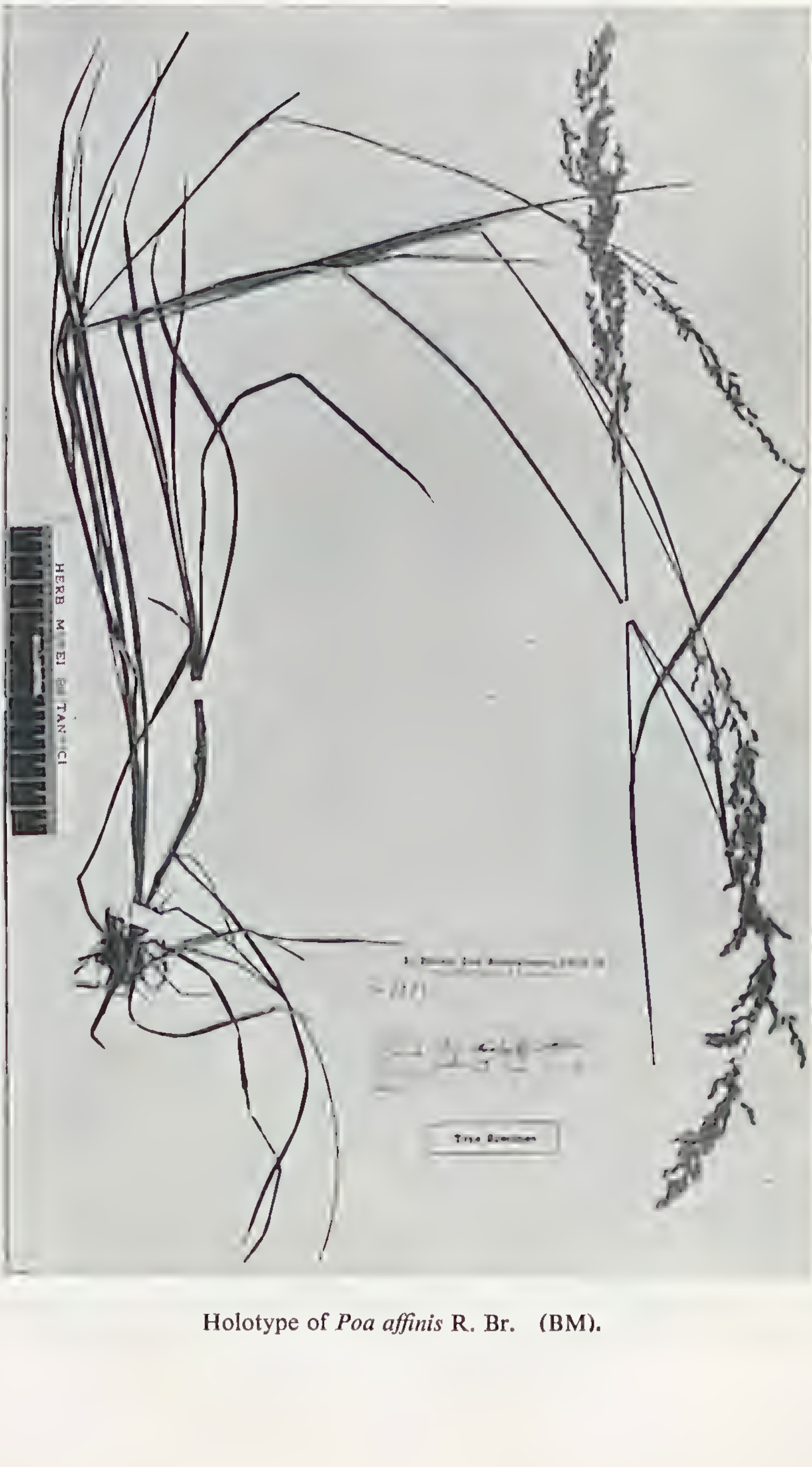
A specimen from National Park, J. Vickery 15.12.1956 (NSW 51234) differs in that the lemma is glabrous on the internerves and the palea is without cilia on the keel; in habit it agrees completely with *P. affinis*, especially with NSW 43246 cited above with which it was growing in association. It is apparent that these characters break down in this as in various other species.

Bentham, l.c., incorrectly included a specimen of *P. serpentum* from Western Australia (Drummond 981) under *P. caespitosa* var. *affinis*. Hooker, Fl. Tas. II (1858) 124, incorrectly described and cited specimens of *P. labillardieri* Steud. as *P. affinis* R.Br.

14. P. ensiformis *Vickery*, sp. nov.

Gramen perenne, laxe vel densiuscule caespitosum saepe innovationibus extravaginalibus et plerumque rhizomatibus horizontalibus vagantibus, plerumque 30–110 cm. altum. Culmi 2– vel 3–nodi, laeves, teretes vel aliquanto compressi, pro ratione robustiusculi, glabri, sub paniculam saepe compressi et plerumque laeves vel rarissime scabriusculi. Nodi glabri. Folia pleraque ad bases plantarum. Vaginae sursum carinatae, tandem laxae, striatae, tenuiter sed densiuscule scabridae, inferiores

Plate XIV.



Holotype of *Poa affinis* R. Br. (BM).

plerumque valde vel leviter purpurascentes. Ligula 0·5–2 mm. longa, firma, truncata, ad apicem minute ciliolata, ad dorsum puberula. Laminae saepe in vivo obscuro-virides, aliquantum in sicco griseo-virides, 5–30 cm. longae, 2–5 mm. latae, in vivo planae, in sicco saepe valde plicatae vel aliquando marginibus incurvatis, lineares, ad apices carinatas acutas subpungentes breviuscule angustatae, plerumque plus minusve rigidae, sublaeves vel tenuiter scabridae vel scabrae, faciebus superioribus glabris, striatae nervis prominentibus, ad margines scabrae. Panicula laxe contracta vel patens, plerumque 6–18 cm. longa, ramis inaequalibus usque ad 10 cm. longis, gracilibus sed firmiusculis, inferioribus 1–5-natis, remote vel dense scabris, ramulis pedicellisque aliquanto angularibus, remote vel dense scabris. Spiculae viridescentes vel purpurascentes, 3–8-flores, pro ratione tenuiter crassae, 5–10 mm. longae. Glumae latae, acutae vel subacuminatae vel raro obtusae, 3-nervatae, sursum ad carinas leviter scabrae, ca. $\frac{2}{3}$–$\frac{4}{5}$ longitudinis lemmatis proximi. Aranea ad lemmata inferiora plerumque copiosa. Lemma 3–5 mm. longum, latiusculum, obtusum, ad carinam subter medium et ad nervos laterales tenuiter pubescens et ad margines prope basin plerumque pilis paucis, plerumque saltem superiores ad internervos prope basin plus minusve laxe et aliquando minute pubescens, sed raro glabrum. Palea firma, latiuscula, ad carinas tribus partibus superioribus tenuiter scabra, deorsum laevis, ad dorsum subglabra vel pubescens vel scabro-pubescens. Antherae 3, 2–3 mm. longae, flavescentes vel purpurascentes. Caryopsis circiter 2 mm. longum, carinatum, contra sulcatum.

Holotype: New South Wales: Ridge above Happy Jacks township, ca. 12 miles south of Kiandra, J. Vickery 20.1.1958 (NSW 43474).

Synonym: *Poa caespitosa* Forst. f. var. *latifolia* Benth., Fl. Austral. VII (1878) 652. Lectotype: Munyong Mountains, F. Mueller 1877 (K; duplicate MEL). (Non *P. latifolia* Forst. f. (1786), nec *P. latfolia* Pohl. (1809), nec *P. latifolia* Phil. (1857–58)).

Loosely to rather densely caespitose perennial, mostly 30–110 cm. high, often with extravaginal shoots in which the young innovations are encased in broad obtuse scales, and commonly with well developed, horizontally spreading rhizomes. Culms mostly about 2- to 3-noded, smooth, terete or somewhat compressed, relatively robust, glabrous, the peduncle often compressed and usually smooth or very rarely somewhat scabrous below the panicle. Nodes glabrous. Leaves mostly at the base. Sheaths keeled upwards, becoming loose, finely but rather closely scabrid, striate; lower sheaths strongly or faintly tinted with purple, this colouration being very rarely absent from at least some part of the lower shoot and usually particularly well shown in summer and autumn. Ligule 0·5–2 mm. long, firm, truncate, minutely ciliolate at the apex and puberulous on the back. Blades often dull green when fresh, often somewhat greyish-green when dry, mostly 5–30 cm. long and 2–5 mm. wide, flat when fresh, often strongly folded when dry and the margins often incurved, linear, rather shortly and abruptly narrowed into the keeled, acute, rather pungent apex, usually more or less rigid, striate, subsmooth or lightly scabrid or scabrous, glabrous on the upper surface, striate with rather prominent nerves, scabrous on the margins. Panicles loosely contracted or spreading, mostly 6–18 cm. long, the lower branches 1- to 5-nate, unequal with the longest up to 10 cm., slender but rather firm, rather remotely to closely scabrous, the secondary branches and pedicels somewhat angular and remotely or closely scabrous. Spikelets greenish or purplish 3- to 8-flowered, often slightly plump (compared with many of the related species), 5–10 mm. long. Glumes broad, acute to subacuminate or rarely more or less obtuse, 3-nerved, lightly scabrous on the keel upwards, about $\frac{2}{3}$–$\frac{4}{5}$ as long as the adjacent lemma. Web usually copious on the lower lemmas. Lemma 3–5 mm. long, rather broad, obtuse, finely hairy on the keel up to about the middle and on the lateral nerves and usually with a few hairs on the margins near the base, usually more or

less loosely and sometimes minutely pubescent on the internerves near the base at least in the upper lemmas. Palea firm, rather broad, finely scabrous on the keels in the upper three-quarters, smooth below, subglabrous to pubescent or scabrous-pubescent on the back. Anthers 3, 2–3 mm. long, yellow or purplish. Grain about 2 mm. long, keeled on one side, furrowed on the other. Locally known as "Cabramurra Grass". Plate IX, 1; Plate X, 3.

Southern Tablelands and coastal ranges of New South Wales, in mountainous districts extending to the coast in eastern Victoria.

NEW SOUTH WALES: Between Mt. Franklin and Bulls Head, large tussock, damp gully with *E. fastigata* and *E. dalrympleana*, N.T. Burbidge No. 2820, 23.3.1958 (CANB; NSW 43478); Upper Tumut River region, in basalt soil, ca. 5000 feet, M. Mueller 15.5.1953 (NSW 43477); near Cabramurra township, in "Snowgum" subalpine woodland on edge of *Eucalyptus gigantea* belt ("occurs in subalpine *Eucalyptus pauciflora* woodland and penetrates into alpine shrub communities above 5800 feet but main occurrence is in the *E. gigantea* forests. Forms strong rhizomes in the autumn, when the sheaths have a marked red-purple colour"), M. Mueller 20.1.1954 (NSW 43484); Cooma, cult. from plant from Cabramurra fire-break, M.E. Phillips 25.11.1959 (NSW 48980); Cooma, cult. from plant from Brown Mountain (coll. J. Vickery 4.1959), M.E. Phillips 25.11.1959 (NSW 50296); Cooma, cult. from plant from Jacob's Ladder, M.E. Phillips 25.11.1959 (NSW 50297); Lower 8 Miles Creek gorge, at gauging station in *Eucalyptus gigantea* forest (Snowy Mountains), M.M. Rae 30.6.1954 (NSW 43475); Toolong Range near Round Mountain, west of the Divide on Tooma Dam site road ca. 18 miles SW. of Kiandra, J. Vickery 20.1.1958 (NSW 43473, 44257); Tooma road, M.E. Phillips 10.2.1956 (NSW 43467); Tooma road, above Tumut Pond, M.E. Phillips 3.2.1956 (NSW 43466); Mt. Jagungal, M. Mueller No. 49, 23.2.1953 (NSW 44255); Big Jagungal at 6000 feet, along creek banks, M. Mueller No. 112, 23.2.1953 (NSW 44266); Schlink Pass in dense *E. pauciflora* woodland, J. Vickery 30.1.1964 (NSW 67688); Snowy Valley Road, between Island Bend and Kosciusko turn-off, J. Vickery & M.E. Phillips 11.1.1956 (NSW 43469); above Island Bend on Plains of Heaven track, Kosciusko Plateau, J. Vickery & M.E. Phillips 9.1.1956 (NSW 43468); between Munyang and Island Bend, N.T. Burbidge No. 3779, 25.2.1952 (CANB; NSW 43479); between Island Bend and Hotel, Mt. Kosciusko, N.T. Burbidge No. 3781, 25.2.1952 (CANB); above Snowy River, along Guthega-Windy Creek track, in "Snow Gum" woodland ("this is one of the forms of "Blue Grass" or "Ledge Grass" of old graziers—one of few palatable types of "Snow Grass"), A.B. Costin 26.1.1958 (CANB; NSW 45381); Kosciusko Plateau, Middle Bog, Plains of Heaven track, M.E. Phillips 22.2.1955 (NSW 43462, 43463); Mt. Kosciusko, 6000 feet, R. Helms 2.1893 (NSW 43472, 44246, 44268); Rennix Gap, Mt. Kosciusko, N.T. Burbidge No. 3714, 23.2.1952 (CANB; NSW 43480); spur running up to Ramshead Range from Pipers Gap (Kosciusko Plateau) in *Eucalyptus niphophila* mallee, M.E. Phillips 26.1.1956 (NSW 43471); Thredbo River gorge, S of Mt. Kosciusko, ca. 5600 feet, on granite, L.A.S. Johnson & E. Constable 19.1.1951 (NSW 18683); Alpine Highway W of Dead Horse Gap, M.E. Phillips 25.1.1956 (NSW 43464); Alpine Highway between Tom Groggin and Geehi River, M.E. Phillips 25.1.1956 (NSW 44247); Alpine Highway, Pilot Lookout, M.E. Phillips 25.1.1956 (NSW 43465); ca. 1 mile W of Dead Horse Gap, Snowy Mts., colonising soil of road batter, J. Vickery 15.1.1959 (NSW 46085); The Pinnacle track at Grass Flat Creek, Geehi River area, stoloniferous over side of road cutting from large coarse tussocks, J. Vickery 9.1.1959 (NSW 46810); Cathcart, J. Vickery 14.1.1940 (NSW 9039; K); Tantawanglo Mountain, near summit, in forest in moist site, J. Vickery 6.1.1959 (NSW 46816); Genoa (Vict.) district in N.S.W., W. Bäuerlen No. 42, 2.1885 (MEL; K).

VICTORIA: Ca. 1 mile S of Gibbo Creek bridge on Nariel to Omeo road, under forest near creek, J. Vickery 11.1.1959 (NSW 46806, 46809); ca. 5 miles S of Upper Nariel at top of divide in forest, J. Vickery 10.1.1959 (NSW 46815); ca. 15 miles S of Upper Nariel at top of divide in "Ash" forest, J. Vickery 10.1.1959 (NSW 46807); S of Sassafras Gap on Nariel to Omeo road in forest, J. Vickery 10.1.1959 (NSW 46813); ca. 5 miles E of Hotham Heights, plants sheltered by low "Snow Gums" and shrubs in dried and damaged subalpine grassland, J. Vickery 11.1.1959 (NSW 46803), and at adjacent site but unsheltered by shrubs, forming turf (NSW 46802); ca. 5 miles E of Hotham Heights, large tussock, J. Vickery 11.1.1959 (NSW 46811); Mt. Donna Buang, A.W. Hill 12.1927 (K); near Still Creek on Jamieson road ca. 22 miles from Eildon, T.B. Muir No. 1642, 31.10.1960 (MEL; NSW 85551); Kinglake, R.A. Black 4.1.1938 (K); Alexander, P. Morris 10.1935 (MEL; K); Kallista, J. Vickery 23.1.1935 (NSW 51238); Upper Yarra, C. Walter 12.1888 (NSW 51237); Mt. Baw Baw, M. Tindale 22.1.1967 (NSW 98001); Wandin, P.R.H. St. John 16.11.1906 (MEL; K).

This species is rather similar in appearance to *Poa helmsii* but can be distinguished by the usually larger coarser spikelets, broader glumes and lemmas, frequent pubescence of the internerves of the lemmas, less strongly compressed culms and sometimes smooth peduncles, purplish colouration of some of the basal leaf-sheaths, frequent development of rhizomes and, when fresh, the darker and duller colour of the foliage. *P. helmsii* is ordinarily restricted to very damp situations, while *P. ensiformis* may grow in adjacent sites, in tall forest or in open natural grassland of the high parts of the Tablelands. It is clearly closely related to *P. hothamensis* q.v., and has some general resemblance to *P. clelandii* and *P. affinis*.

The other specimen cited by Bentham under *P. caespitosa* var. *latifolia*, viz. Illawarra, Johnson, has not been found amongst the collections of the Royal Botanic Gardens, Kew. Judging by the locality in which it was collected I would consider it unlikely to be identical with the Lectotype of the variety.

15. P. hothamensis *Vickery*, sp. nov.

Gramen perenne, erectum vel ex rhizomate contracta vel plus minusve elongata obliqua vel horizontale ascendentum, 15–90 cm. altum, saepe innovationibus extravaginalibus cum ad bases squamulis latis. Culmi subteretes vel paululum compressi, scabridi vel scabro-pubescentes, ca. 3–nodi, sub panicula laeves vel tenuiter scabri. Nodi minute scabro-pubescentes. Vaginae, praesertim inferiores, plerumque purpurascentes, minute sed densiuscule scabro-pubescentes vel raro sublaeves vel scabridae, striatae, inferioribus tandem laxis. Ligula 0·5–2 mm. longa, firme membranacea, truncata, ad apicem minute ciliolata, ad dorsum puberula. Laminae lineares, 7–30 cm. longae, 1·5–5 mm. latae, ad apices breves, acuti, carinati, leviter pungentes breve angustatae, in vivo planae vel concavae, saepe in sicco plus minusve plicatae vel marginibus involutis, aliquando glaucae vel viridescentes, marginibus scabris, faciebus exterioribus plerumque minute scabro-pubescentibus vel raro sublaevibus, faciebus interioribus plerumque pilis brevibus vel elongatis tenuibus parce vestitis. Panicula 3–25 cm. longa, laxiuscula, ramis inferioribus 2–5–natis, inaequalibus, longissimis usque ad 12 cm., superioribus gradatim brevioribus, supra medium ramulis spiculisque instructis. Spiculae 2–6–flores, viridescentes vel purpurascentes. Glumae 3–nervatae, acutae, ad carinas scabrae, praesertim superior latiuscula, ca. $\frac{2}{3}$ longitudinis lemmatis proximi. Aranea macilenta ad lemmata inferioria. Lemma ca. 2·75–3·75 mm. longum, lanceolatum vel late lanceolatum, subacutum vel obtusum, internervis ad partes inferiores dense pubescentibus, pilis ad carinam et nervos laterales et margines plerumque paulum longioribus. Palea lanceolata, ad carinas ad partem dimidiam vel tertiam superiorem minute scabra tum ciliolata tum ad basem laevis, ad dorsum pubescens vel scabro-pubescens. Antherae ca. 1·8 mm. longae, flavae.

HOLOTYPE: VICTORIA: Mt. Buffalo, 4300 feet, on granite, R.H. Cambage No. 3742, 19.1.1913 (NSW 9059; duplicates at K; SYD).

Perennial, erect or ascending from a contracted rootstock or more or less elongate, oblique or horizontal rhizome, with extravaginal innovations enclosed at first in broad scales, 15–90 cm. high. Culms subterete to slightly compressed, scabrid to scabrous-pubescent, about 3–noded, smooth or finely scabrid below the panicle. Nodes minutely scabrous-pubescent. Sheaths (especially the lower) usually tinted with purple, minutely but rather closely scabrous-pubescent to rarely scabrid or subsmooth, striate, the lower becoming loose. Ligule 0·5–2 mm. long, firmly membranous, truncate, minutely ciliolate at the apex and puberulous on the back. Blades linear, 7–30 cm. long, 1·5–5 mm. wide, shortly narrowed into the short, acute, keeled, slightly pungent apex, flat or concave when fresh, often becoming more or less folded or with inrolled margins when drying, somewhat glaucous to green, the margins scabrous, the lower surface usually minutely scabrous-pubescent to rarely subsmooth, the upper surface usually thinly clothed with short or elongate fine hairs up to 0·5 mm. long. Panicles 3–25 cm. long, rather loose, the lowest branches 2– to 5–nate, the branches unequal with the secondary branches and spikelets mostly in the upper third or half, the longest up to 12 cm., the upper whorls of branches progressively shorter, the branches and pedicels scabrous. Spikelets 2– to 6–flowered, green or purplish. Glumes 3–nerved, acute, scabrous on the keels, about two-thirds as long as the adjacent lemma. rather broad especially the upper. Web present on the lower lemmas, rather scanty. Lemma about 2·75–3·75 mm. long, lanceolate to broadly lanceolate, subacute to obtuse, closely pubescent on the internerves in the lower third to half with the hairs usually a little longer on the keel, lateral nerves and margins. Palea lanceolate, minutely scabrous on the keels in the upper half, ciliolate below and smooth at the base, pubescent to scabrous-pubescent on the back. Anthers ca. 1·8 mm. long, yellow. Known in Victoria as "Ledge Grass", or variously qualified as "Broad-leafed" or "Narrow-leafed Ledge Grass". Plate IX, 5.

A common grass at high elevations on the Victorian Alps.

VICTORIA: Mt. Buffalo, J. Vickery 9.4.1958 (NSW 44271, 44272); Mt. Buffalo, 4000 feet, very common, H.C.E. Stewart 9.1.1950 (BRI); Mt. Buffalo, on rocky granite hillside in Eucalypt forest, ca. 4500 feet, densely tufted, erect to 3 feet, somewhat glaucous, spikelets green, S.T. Blake No. 7323, and spikelets purplish No. 7324, 25.1.1935 (BRI); Buffalo Mts., H.B. Williamson No. 1362, 1906 (MEL); Mt. Buffalo, R.A. Black 29.1.1938 (K); Mt. Buffalo, under shelter of "Snow Gums", J. Vickery 13.1.1959 (NSW 46795); Mt. Buffalo, ca. 5300 feet, J. Vickery 13.1.1959 (NSW 46801); Mt. Buffalo, E. Reiner No. 235, 7.1.1950 (CANB); Bogong High Plains, grassy slopes near Cope Hut, J.S. Turner 1.1948 (MEL; K); Bogong High Plains at ca. 5500 feet, at Rocky Knobs, head of Rocky Valley, J.H. Willis 10.1.1946 (MEL; K), and J.S. Turner 1.1946 (MEL; K); Bogong High Plains, southern slope of Mt. Nelson, 6000 feet, T.B. Muir No. 1044, 11.1.1960 (NSW 70809); N of Pretty Valley bridge, Kiewa Power Scheme, N of Bogong High Plains, common, colonising road batters, J. Vickery 14.1.1.1959 (NSW 46798); Bogong High Plains, ca. 5500 feet, in subalpine grass- and shrub-land, J. Vickery 14.1.1959 (NSW 46796, 46800); Bogong High Plains, near Falls Creek, T.B. Muir No. 718, 21.1.1959 (MEL; NSW 98004); Bogong High Plains, ridge near Wallace's Hut, ca. 5500 feet, T.B. Muir No. 707 (MEL; NSW 85377); Bogong High Plains, hillside W of Wallace's Hut, 5600 feet, T.B. Muir No. 669, 19.1.1959 (MEL; NSW 85376); Bogong High Plains, near Middle Creek, 5300 feet, T.B. Muir No. 681, 19.1.1959 (MEL; NSW 85375); Bogong High Plains, North Kelso Creek, S side of Spion Kopje, A.C. Beauglehole No. 22335 (NSW 85450); Bogong High Plains, Watchbed Creek area, A.C. Beauglehole No. 15621 in part, 27.1.1966 (NSW 85571); Rocky Valley, E Kiewa Valley, E. Reiner No. 217, 4.1.1960 (CANB); cult. at Cooma (N.S.W.) from plant from Langford's Cut, Kiewa catchment on 27.11.1958, M.E. Phillips & M. Carr 25.11.1959 (NSW 58695; CBG 003076); Alpine Highway between Harrietville and Hotham Heights, under eucalypt forest near snow-line, W.V. Ludbrook 24.11.1940 (CANB); between Mt. Hotham and Harrietville, in "Ash" forest, J. Vickery 11.1.1959 (NSW 46799, 46804); Mt. Hotham, J.H. Maiden 1.1900 (NSW 44269); Mt. Hotham, very common in alpine grassland, J. Vickery 8.4.1958 (NSW 44270); Mt. Hotham, 6000 feet, R.A. Black 30.1.1938; Hotham Heights, leaves stiff and folded in open subalpine grassland, softer and broader under shelter of "Snow Gum" coppice, J. Vickery 11.1.1959 (NSW 46812); on ridge between Mt. Hotham and Mt. Loch, J. Vickery 12.1.1959 (NSW 46797); towards Mt. Feathertop, 4000–5050 feet, A.J. Tadgell 3.1917 (MEL).

This species occupies a very similar habitat to that in which *P. ensiformis* is found in forests at moderately high altitudes. It appears, however, to be much more adaptable, and it commonly extends into open subalpine grassland. In the shelter of trees and shrubs its leaves are longer, flatter and broader, while even a few feet or inches away but removed from shelter the leaves are shorter, narrower, stiffer and often folded. It is common in subalpine grassland in areas obviously once populated with "Snow-gums" and shrubs but, through the action of fire and grazing, now open and populated only by grass and herbs. *P. ensiformis* rarely, if ever, persists in such situations. *P. hothamensis* appears to be an effective coloniser of bare soil in subalpine and high forest areas.

In general aspect *P. hothamensis* is rather similar to *P. ensiformis*, but may usually be distinguished by the manifest scabrous-pubescence of the sheaths and lower surfaces of the blades, and the short or elongate hairs on the upper surface of the blades.

16. P. clelandii *Vickery*, sp. nov.

Gramen perenne, laxe vel densiuscule caespitosum, surculis extravaginalibus ex rhizomate contracto vel raro paulo elongato surgentis et squamulis firmis latis basi vestitis. Culmi usque ad circa 75 cm. alti, tereti vel plus minusve compressi, aliquando sub paniculam valde compressi, in dimidio inferiore foliosi, graciles, ca. 3–4-nodi. Vaginae tandem laxae, saepe quam internodos longiores, deorsum valdiuscule compressi carinatique, plerumque glabrae, laeves vel minime scabridae, saepe paulo purpurascentes. Ligula 0·25–1·75 mm. longa, truncata, minute puberula. Laminae saltem in vivo planae, in sicco aliquando marginalibus convolutis sed plerumque apicibus explanatis vel plicatis perseverentibus, aliquanto arcte erectae, firmae, usque ad 25 cm. longae, 1–3 mm. latae, lineares, ad apices breves acuti plerumque paulo curvati carinati abrupte angustatae, plerumque glabrae, sublaeves vel ad nervos minute scabrae. Panicula plus minusve lanceolata, laxe contracta ramis erectis vel anguste patentibus, usque ad 20 cm. longa, rhachide ramis ramulisque pedicellisque scabris, ramis inaequalibus gracilissimis sed exigue filiformibus, ad dimidium vel trientem inferiorem sine spiculis, inferioribus 2–3-natis. Spiculae 3–5-flores, purpurascentes vel viridescentes vel stramineae, paulo arctae et ad ramos appressae. Glumae acutae, plerumque breviusculae latiusculae, ad carinas et aliquanto ad facies laterales scabrae, ca. $\frac{2}{3}$–$\frac{3}{4}$ longitudinis lemmatis proximi, superiore quam inferiore longiore lateriore. Aranea praesens vel absens. Lemma 1·75–3 mm. longum, obtusum, latiusculum, manifeste 5-nervatum, firmum, ad carinam sursum minute scabrum, ad partem inferiorem dorsi pubescens mutabile aut subglabrum aut internervis abundanter vel perparce pubescentibus pilis minutis appressis vel obscuris et aliquando ad carinam nervosque pilis longioribus. Palea lemma subaequalans, ad carinas sursum minute scabra deorsum ciliolata, ad dorsum deorsum parce pubescens. Anthera ca. 1·3 mm. longa, purpurascentes vel flavescentes. Caryopsis ellipticum, ca. 1·5 mm. longum, 0·5 mm. latum, carinatum, contra sulcatum.

HOLOTYPE: SOUTH AUSTRALIA: National Park (near Adelaide), J.B. Cleland 17.12.1949 (AD 95626093).

Loosely or rather densely caespitose perennial, the shoots extravaginal from a contracted rootstock or occasionally shortly elongate rhizome and clothed at the base with firm broad scales grading upwards into fully developed leaf-sheaths. Culms up to about 75 cm. high though often shorter, terete to more or less compressed and sometimes strongly compressed below the panicle, leafy in the lower half, slender, ca. 3- to 4-noded. Sheaths becoming loose, often longer than the internodes, rather strongly compressed and keeled below, usually glabrous, smooth or very slightly scabrous, often tinted with purple. Ligule 0·25–1·75 mm. long, truncate, minutely puberulous. Blades flat at least when fresh, the margins tending to become inrolled on drying but the apical portion commonly remaining expanded or folded, somewhat stiffly erect, firm, up to 25 cm. long, 1–3 mm. wide, linear, abruptly narrowed to a short, acute, sometimes slightly curved, keeled apex, usually glabrous, minutely scabrous on the nerves or subsmooth. Panicle more or less lanceolate, loosely contracted with erect or narrowly spreading branches, up to 20 cm. long, the rhachis, branches and pedicels scabrous, the lowest branches 2- to 3-nate, unequal, bare at the base for $\frac{1}{3}$–$\frac{1}{2}$ their length, very slender but scarcely filiform. Spikelets 3– to 5–flowered, purplish, greenish or straw-coloured, slightly crowded and appressed to the branches. Glumes acute, the upper longer and broader, both about $\frac{2}{3}$–$\frac{3}{4}$ as long as the adjacent lemma, usually rather short and broad, scabrous on the keels and somewhat on the sides. Web present or absent. Lemma 1·75–3 mm. long, obtuse, rather broad, with rather variable pubescence on the lower part of the back, with a well-developed or sparse or minute and adpressed or obscure pubescence on the internerves and sometimes with longer hairs on the keel and nerves, or subglabrous, distinctly 5–nerved, firm, minutely scabrous on the keel above, firm. Palea about as long as the lemma, minutely scabrous on the keels in the upper third or half, ciliolate below, sparsely pubescent on the lower back, Anthers about 1·3 mm. long, purplish and yellowish. Caryopsis elliptical in outline, ca. 1·5 mm. long, 0·5 mm. broad, keeled on one side, furrowed on the other.

Chiefly in South Australia but extending into Victoria.

Victoria: French Island, J.S. Ramsey 25.11.1904 (MEL; K); Grampians, D. Sullivan 1,1882 (MEL; K); Grampians, E side of Victoria Range, A.C. Beauglehole No. 4613 & P.E. Finck, 25.2.1957 (NSW 85577); Grampians, Victoria Range, Chimney Pot Gap road, A.C. Beauglehole No. 4785 (NSW 85578); Halls Gap, Grampian Mountains, J.E. Tilden 12.1912 (K); Wannon Valley above Dunkeld, H.B. Williamson 10.11.1899 (MEL); Kentbruck, W of Portland, A.C. Beauglehole No. 7696, 10.1946 (NSW 85576).

South Australia: Glen Osmond, D.E. Symon 29.11.1951 (ADW 7238, 7239); National Park, J.B. Cleland 16.12.1939, 7.12.1940, 14.11.1942, 29.12.1942, 1943, 28.12.1943, 29.12.1943, 27.12.1946, 27.11.1948, 17.12.1949, 30.12.1948, 29.11.1952 (AD); NE corner of National Park, J.B. Cleland 24.11.1951 (ADW 9002); Mt. Pleasant, J.M. Black 1933 (AD); National Park, Belair, J.B. Cleland 29.12.1942 (AD); National Park, J.B. Cleland 6.12.1958 (NSW 46904; JBC); National Park, in grassy land, J.B. Cleland 18.11.1958 (NSW 46905; JBC); Upper Waterfall Gully (near Adelaide), J.B. Cleland 26.12.1942 (AD); Torrens, F. Mueller (MEL); Vimy Ridge (Adelaide Hills), L.D. Williams (LDW); Forest Range-Carey's Gully (near Adelaide), J.B. Cleland 18.12.1943 (AD); Clarendon (AD); Clarendon, Tepper (MEL); road near Clarendon, H.W. Andrews (AD); Cherry Gardens, J.B. Cleland 24.11.1946 (AD); cult. from plant from Germantown Hill, D.E. Symon 7.11.1951 (ADW 19039); Kuitpo, J.B. Cleland 11.1922 (AD); Aldgate, J.H. Maiden 1.1907 (NSW 43059, 9061; K); Aldgate, O.E. Menzel 11.1896 (AD); Aldgate, J.B. Cleland 11.1923 (AD); Mt. Lofty Ranges, O.E. Menzel 11.1896 (K; BRI); Mt. Lofty, E.H. Ising No. 2314, 15.12.1923 (K); Mt. Lofty Botanic Garden, R.H. Kuchel No. 1508, 5.12.1963 (AD; NSW 85547); Mylor, J.F. Bailey 26.11.1930 (K); Basket Range, J.F. Bailey 26.11.1930 (K); Mt. Compass, J.B. Cleland 16.1.1943 (AD); road between Inman Valley and Hindmarsh Tiers, J.B. Cleland No. H141, 8.1.1926 (AD; K); Square Water Hole (near Mt. Compass), J.B. Cleland 16.1.1943 (AD); Cleland's Gully, Mt. Compass, J.B. Cleland 22.4.1930 (AD); Encounter Bay, J.B. Cleland 1.1924, 8.1.1943 (AD); Myponga, J.B. Cleland No. H143, 1.1929 (AD; K); near Cut Hill above Victor Harbour, J.B. Cleland 1.1929 (AD); hills near Port Elliott, J.B. Cleland 5.12.1936 (AD); Back Valley, Encounter Bay, J.B. Cleland No. H142, 17.11.1930 (AD; K); Halls Creek, Encounter Bay, J.B. Cleland 1.1.1953 (AD); Callawonga Creek, Fleurieu Peninsula, F.M. Hilton 25.11.1953 (ADW 19037); near Coorong, Meningie, L.D. Williams 22.12.1952 (LDW).

This species is named in honour of Sir John Cleland, of Adelaide, whose admirable and numerous collections have done so much to enable its characteristics and distribution to be known.

P. clelandii is closely related to *P. ensiformis*, *P. hothamensis* and *P. affinis*, but appears to form a distinct population.

17. P. umbricola *Vickery*, sp. nov.

Gramen perenne aliquanto vagante foliosum basi innovationibus extravaginalibus, culmis sursum ramosis fasciculis surculorum intravaginalibus, forsitan laxe stoloniferum. Internodia plerumque quam vaginas breviora et occulta laevia. Nodi glabri. Vaginae laeves, circa culmos arctatae, inferioribus tandem aliquando laxis, paullo carinatae, leviter striatae, inferioribus pallidis vel fuscis. Ligula ca. 0·5 mm. longa, truncata, tenuiter ciliolata. Laminae 2–15 cm. longae, 1–2 mm.

latae, planae vel laxe involutae, sensim ad apices tenues attenuatae, firmae sed haud rigidae, in faciebus inferioribus laeves, ad faciebus superioribus minute scaberulae. Panicula exserta, tandem patens, ramis tenuibus capillaribus spiculas sursum ferentibus, pedicellis scabris. Spiculae compressae, 3–4–flores, viridescentes vel purpurascentes, ca. 3·5 mm. longae. Glumae subaequales vel superior quam inferior paullo longior, 3–nervatae, paullo macilentae, sursum carinatae, carinis leviter scabris, marginibus membranaceis. Aranea absens vel exigua. Lemma ca. 2·5–3 mm. longum, 5–nervatum nervis saepe paullo prominentibus, obtusum, marginibus sursum membranaceis, saepe glabrum vel aliquando in carina nervisque sed rarissime internervos pubescens. Palea lemma subaequans sed angustior, in carinis sursum scabra, in dorso glabra. Antherae 1–1·25 mm. longae.

HOLOTYPE: SOUTH AUSTRALIA: Mt. Lofty Range, Morialta Falls, ca. 10·5 km. ENE of Adelaide, near top of first fall, Hj. Eichler No. 14257, 12.10.1957 (AD 95824051; duplicate NSW 85459).

Rather straggling leafy perennial with extravaginal innovations at the base and the culms branching upwards with fascicles of intravaginal shoots, perhaps often laxly stoloniferous. Internodes mostly shorter than and concealed by the sheaths, smooth. Nodes glabrous. Sheaths smooth, close around the culms, the lower at length becoming somewhat loose, slightly keeled, lightly striate, the lower pallid or brownish. Ligule about 0·5 mm. long, truncate, finely ciliolate. Blades 2–15 cm. long, 1–2 mm. broad, flat or loosely inrolled, gradually narrowing into a fine point, firm but not rigid, smooth on the lower surface, minutely scaberulous on the upper surface. Panicle exserted, at length spreading with slender capillary branches bearing spikelets in their upper parts, the pedicles scabrous. Spikelets compressed, 3– to 4–flowered, greenish to purplish, ca. 3·5 mm. long. Glumes subequal or the upper slightly longer than the lower, 3–nerved somewhat thin, keeled upwards and lightly scabrous on the keels, the margins membranous. Web absent or very scanty. Lemma about 2·5–3 mm. long, 5–nerved with the nerves often somewhat prominent, obtuse, with membranous margins upwards, often completely glabrous or sometimes with scanty hairs on the keel and sometimes on the nerves but very rarely on the internerves. Palea subequal to the lemma in length but narrower, scabrous on the keels in the upper two-thirds, glabrous on the back. Anthers 1–1·25 mm. long.

SOUTH AUSTRALIA: Mt. Lofty Range, among rocks, steep hillside, small tufts, Tepper No. 1130, 10.1883 (MEL), and wooded hillside among rocks, Tepper No. 1131, 2.11.1883 (MEL); Mt. Lofty Range, Morialta, J.B. Cleland 28.11.1942 (AD, 3 sheets); Mt. Lofty Range, Waterfall Gully, in shade, J.B. Cleland 28.11.1931 (AD; K Nos. H554, H555; BRI); Waterfall Gully, in shady places, J.B. Cleland (AD); Waterfall Gully (AD); Stonyfell, Burnside (AD); Adelaide Plains, Greenhill Road, J.B. Cleland 16.11.1950 (AD).

The straggling branching habit of this species, together with the generally narrower and more attenuate blades and usually glabrous lemmas seem to distinguish this species from *P. clelandii* which occurs in the same districts. The coarser, firmer foliage and apparent lack of extravaginal aerial shoots serves to differentiate it from the more delicate *P. tenera*.

18. P. cheelii *Vickery*, sp. nov.

Gramen perenne, surculis simplicibus vel fasciculatis ex rhizomate laxe contracta vel subelongata surgentibus, rhizomate innovationeque in squamulis brevibus latis vestito. Culmi 40–100 cm. alti, modeste graciles, glabri, sublaeves vel infra paniculam plus minusve scabri, teretes vel leviter compressi, striati, plerumque quam foliis multum longiores, ca. 3–nodi. Nodi glabri. Folia plerumque plantae ad basem, viridia, interdum paulum rigida, plus minusve erecta. Vaginae firmae, carinatae sed haud valde compressae, scaberulae, viridescentes vel purpurascentes,

basibus fibrosis paulum persistentibus. Ligula ca. 1 mm. longa, firme membranacea, truncata, ad margines dorsoque minute puberula. Laminae plerumque in vivo planae, in sicco plus minusve plicatae vel marginibus laxe involutis, lineares, ad apices carinatos arctos vel uncinatos abruptiuscule angustatae, plerumque 8–25 cm. longae, 1–4 mm. latae explanatae. Panicula plerumque 8–25 cm. longa, basi laxa, sursum paulum contracta, extremos versus ramulorum spiculis ferens, ramis plus minusve capillaribus, inaequalibus, inferioribus primariis 2–6–natis, longioribus usque ad 14 cm. longis, superioribus gradatim brevioribus, ramis pedicellisque scabris. Spiculae viridescentes vel purpurascentes, 3–6–flores. Glumae 3–nervatae, ad nervos leviter scabrae, acutae vel subacutae, inaequales, superior parum longior, ca. $\frac{1}{2}$–$\frac{3}{4}$ longitudinis lemmatis proximi, aliquando carinatae, modeste latae vel latae. Aranea longa, macilenta vel modeste abundans. Lemma 3·0–4·5 mm. longum, angustiusculum vel latiusculum, obtusum, ad carinam et nervorum lateralium in dimidio inferiore breve pilosum, alio modo glabrum, sursum ad carinam minute scabrum. Palea ad carinas sursum tenuiter modeste denseque scabra, deorsum laevis, vel raro prope basin tenuiter ciliolata, ad dorsum pubescens, in medio sulcata. Antherae 3, 1·8–2·5 mm. longae, lineares, flavae vel paulum purpurascentes. Caryopsis oblongum, ca. 2 mm. longum, sulcata, ad dorsum convexum, aureo-brunneum.

Holotype: New South Wales: Blue Mountains: Between Mt. Victoria and Blackheath, J. Vickery 1.1.1958 (NSW 43187).

Perennial with the shoots extravaginal and arising singly or in fascicles from a loosely contracted or subelongate rhizome system often resulting in a loose or somewhat dense tussock, the rhizome and innovation buds clothed in short broad scales. Culms mostly 40–100 cm. high, only moderately slender, glabrous and subsmooth, or more or less scabrous below the panicle, terete or very slightly compressed, striate, usually much exceeding the leaves, about 3–noded above the base. Nodes glabrous. Leaves mostly from the base, green, sometimes rather rigid, more or less erect. Sheaths firm, keeled but not strongly compressed, scaberulous, green or purplish, the fibrous bases rather persistent. Ligule ca. 1 mm. long, firmly membranous, truncate, minutely puberulous on the margins and back. Blades mostly flat when fresh, tending to become folded on drying or the margins becoming loosely inrolled, linear, rather abruptly narrowed into the acute, keeled, straight or hooked tip, mostly 8–25 cm. long, the culm leaves rather shorter, 1–4 mm. wide when expanded. Panicles mostly 8–25 cm. long, loose at the base, somewhat contracted above, with the spikelets towards the ends of the branches, the lower primary branches 2– to 6–nate, more or less capillary, unequal, the longer up to 14 cm. long, the upper branches progressively shorter, the branches and pedicels scabrous. Spikelets greenish or purplish, 3– to 6–flowered. Glumes 3–nerved, lightly scabrous on the nerves, acute or subacute, unequal with the upper slightly longer, half to three-quarters as long as each adjacent lemma, somewhat keeled, moderately broad to broad. Web long, scanty to moderately copious. Lemma 3·0–4·5 mm. long, rather narrow to rather broad, obtuse, shortly hairy on the keel in the lower half and on the lateral nerves in the lower quarter or near the base, otherwise glabrous, minutely scabrous on the keel above. Palea finely and rather densely scabrous on the keels in the upper half to three-quarters and smooth below, or rarely finely ciliolate near the base (as in the specimen from Central Tilba), sparsely scabrous-pubescent on the back, furrowed down the centre. Anthers 3, 1·8–2·5 mm. long, linear, yellow or slightly purplish. Grain golden-brown, oblong, ca. 2 mm. long, convex on the back, furrowed in front.

Chiefly Central and South Coast of New South Wales extending to the adjacent Tablelands, and recorded from south-east Queensland.

QUEENSLAND: McPherson Range, on slopes of Mt. Ballow in *Eucalyptus grandis—E. microcorys* forest, 2000–3000 feet, S.T. Blake No. 13100, 25.7.1937 (BRI).

NEW SOUTH WALES: Sieber, Agrostotheca No. 75 (MEL); Blue Mountains, comm. Chas. Moore 9.1874 (K); Glenbrook, ca. 1,000 feet, in rocky sandstone country, H.S. McKee No. 6738, 4.1.1959 (NSW 46789); Springwood, H. Deane 10.1886 (NSW 43196); National Pass, Wentworth Falls, H.S. McKee 28.12.1958 (NSW 46787); near Wentworth Falls, on wet rocks, H.S. McKee No. 6711, 28.12.1958 (NSW 46788); Katoomba, 10.12.1934 (NSW 43195); Katoomba, J.H. Camfield 12.1908 (NSW 9099; K); Medlow, A. Griffith 18.12.1914 (NSW 9040; K); Liverpool Plains, A. Cunningham 5.1825 (K); 5 miles SE of Bell on Mt. Tomah road, E.F. Constable 11.1.1960 (NSW 52947); Oakdale, M.E. Potter 5.1.1966 (NSW 89683); Burragorang Lookout, O.D. Evans 16.11.1961 (UNSW); Picton Lakes, O.D. Evans 13.12.1960 (UNSW); Picton Lakes, D. Blaxell 13.12.1962 (UNSW); SW of Picton on road to Thirlmere, O.D. Evans 13.12.1962 (UNSW); Appin, E.J. McBarron No. 11681, 18.12.1965 (NSW 89794); Hill Top, J. Shirley (K; BRI); 1½ miles N of Hill Top, E.J. McBarron No. 10552, 6.2.1965 (NSW 73681); Wattle Ridge via Hill Top, E. Cheel 2.1912 (NSW 43199); Hill Top, E. Cheel 1.1.1913 (NSW 43194), 25.12.1911 (NSW 43193) and 17.12.1911 (NSW 9100; K); ca. 5 miles from Avon Dam on Bargo road, J. Vickery 16.1.1958 (NSW 43197); Penrose State Forest at Hume Highway, J. Vickery 16.1.1958 (NSW 43198); Abercrombie Caves turn-off, C.K. Ingram 11.11.1961 (NSW 51543); ca. 2 miles S of Fitzroy Falls in sandstone country, J. Vickery 5.1.1959 (NSW 46790); near Tomerong, F.A. Rodway 24.12.1929 (NSW 43192); Bodalla (NSW 43190); ca. 1 mile S of Central Tilba on Bermagui road, J. Vickery 5.4.1958 (NSW 43189); between Cuttagee and Bunga on the Bermagui to Bega road, J. Vickery 6.4.1958 (NSW 43188); between Wapengo and Tanja on Bermagui to Bega road, roadside in hilly coastal forest, J. Vickery 6.1.1959 (NSW 46791); Bega, E. Breakwell 12.1913 (NSW 43191).

This species resembles *P. labillardieri* considerably in spikelet characters but is distinguished by the closely scaly rhizomes and by the plant being usually much less densely caespitose. It is often found on stony ground, whereas *P. labillardieri* flourishes best on deep soils.

Named in honour of Edwin Cheel whose early collections of it first drew my attention to this species and its distinctive rhizome system.

19. P. serpentum *Nees* in Lehmann, Pl. Preiss. II (1846) 106.

HOLOTYPE: WESTERN AUSTRALIA: "In solo humoso ad flumen Serpentine, Wellington, Dec. a. 1839. Herb. Preiss. No. 1855". A sheet bearing this number is preserved at the Botanical Institute of the Academy of Sciences, Leningrad. On the sheet are portions of five plants. One plant bears a panicle about 23 cm. long with green spikelets in which the lemmas are quite glabrous and devoid of any web. This agrees with Nees' description of *P. serpentum* and I now nominate this plant as LECTOTYPE. Three other plants on the sheet bear brownish over-mature panicles from which many of the lemmas have fallen; the lemmas of these plants bear hairs on the keel and the web is present, characters which do not agree with *P. serpentum* Nees; these plants are probably *P. porphyroclados* Nees but are not in a suitable condition to permit certain identification. The fifth plant is quite distinct from the others and bears hairy leaf-sheaths; as no inflorescence is present the plant has not been identified. I have not succeeded in locating any other sheet of this number amongst Preiss collections in any other European herbarium.

SYNONYMS: *P. caespitosa* var. *serpentum* (Nees) Benth., Fl. Austral. VII (1878) 651, based on *P. serpentum* Nees.

P. maxwelli Benth., l.c. 653. (HOLOTYPE: WESTERN AUSTRALIA: King Georges Sound, Maxwell 1872 (K; duplicate at PERTH; MEL); Gardner, Fl. West. Austral. I, Part 1, Gram. (1952) 108 (*P. maxwelli* was originally described as being 2– to 3–flowered, but some spikelets on the holotype sheet are 4–flowered.)

P. sieberiana var. *spithamea* Nees in Lehmann, Pl. Preiss. II (1846) 106, nomen nudum. Nees cites "Herb. Preiss No. 1821". A specimen of this number, preserved in the Stockholm Herbarium, appears to be an unusually small plant of *P. serpentum*, with fine smooth leaves and rather small, glabrous spikelets and florets. Another specimen of this number is preserved in the Botanical Institute of the Academy of Sciences of U.S.S.R., Leningrad; it is a small plant of *P. serpentum*.

Rather coarse, densely caespitose, glabrous perennial, often with extravaginal innovations, 50–100 cm. high. Culms usually much exceeding the leaves, terete, mostly smooth, or slightly scaberulous between the nerves, sometimes slightly scabrous below the panicle, about 3–noded, moderately robust. Sheaths smooth or lightly scaberulous to finely scabrous, striate, close around the culms or the lower becoming somewhat loose. Ligule very short, truncate, ciliolate at the apex and puberulous on the back. Blades 1–2 mm. wide when expanded, but usually inrolled, 20–50 cm. long, tapering to a fine, folded and keeled point, mostly smooth on the outer surface, grooved, and scabrous on the sides of the grooves on the inner surface. Panicle much exserted at maturity, 15–25 cm. long, usually very loose with long, capillary branches which are generally bare in the lower half or two-thirds and only sparingly branched, more rarely the panicle a little contracted and then the shorter branches bearing spikelets almost to the base; rhachis terete, smooth; branches lightly scabrous, unequal, the longest up to 13 cm., with few spikelets on each ultimate branch, the lowest branches 3– to 7–nate; pedicels lightly scabrous, the lateral short (about (0·5–1 mm.) but not very stout, the terminal much longer and more or less filiform, somewhat expanded at the apex. Spikelets pale greenish purplish or straw-coloured, compressed, ovate, about 4–6 mm. long with 2–6 florets Glumes acute to subobtuse, not broad, keeled, slightly scabrous on the keels, smooth on the sides, subequal or the upper a little longer, the lower three-quarters to seven-eighths as long as the lowest lemma and 1– to 3–nerved, the upper 3–nerved. Web absent, or very rarely a slight trace of it present. Rhachilla segments about 0·75 mm. long, smooth or sparsely scabrous or rarely with occasional fine hairs. Lemma glabrous, obtuse, not broad, 2·75–4 mm. long, 5–nerved (or rarely faintly 7–nerved), very minutely scabrous on the keel, rarely slightly scaberulous on the sides. Palea about as long as the lemma, scabrous to scabrous-ciliolate on the keels above and smooth below, glabrous to scabrous-pubescent on the back. Lodicules membranous, small, with one broad and one very fine lobe. Anthers 1·75 mm. long, yellow or purplish-tinted. Ovary broadly turbinate, depressed at the apex. Grain about 2 mm. long, plump, oblong, furrowed, free from or adherent to the palea and lemma.

WESTERN AUSTRALIA: Drummond No. 981 (MEL); Walcott (K); F. Stoward 11.1914 (NSW 39057); C.A. Gardner No. 6617 (PERTH); Geraldton, A. Lee (K); Big Brook, M. Koch No. 2630, 1.1922 (PERTH; K); near Lake Logue, in calcareous places, C.A. Gardner No. 8492, 16.10.1946 (PERTH); Blackwood River, low bushy places, Oldfield (MEL; K); Gordon River, Oldfield (K); Karri Dale, valleys and hill slopes, P. Walcott 12.1867 (MEL; K); Leederville 11.1901 (NSW 39054); Jarnadup, Knox-Peden No. 59, 20.12.1918 (NSW 39058); Swan River, Drummond No. 168B (K); Swan River, A. Helmich (MEL); Marradong, Darling Ranges, A. Morrison 12.11.1904 (PERTH); Darling Range, A. Morrison 29.11.1898 (K); Mount Barker, in native woodland, shady spot, C.A. Gardner 10.1944 (PERTH); Mount Barker, G.K. Baron-Hay 12.1924 (PERTH; K); Muchea, Midland Railway, herb. A. Morrison 11.1909 (K); shady borders of lake, Carrington, near Perth, herb. C. Andrews 28.10.1902 (K); Wooroloo, M. Koch No. 1825, 11.1907 (K; NSW 39055, 39056; AD; MEL); near Manjimup, H.R. Ward 12.1925 (PERTH); Manjimup, W.M. Carne 19.12.1923 (PERTH); between Esperance Bay and Frasers Range, Dempster 1877 (K) and 1876 (MEL; K); Albany, herb. A. Morrison 11.1896 (K); Albany, R. Helms 11.1896 (PERTH; K); King Georges Sound, Walcott, herb. F. Mueller 1877 (K), named *P. maxwelli* in Bentham's handwriting and very similar to its Holotype though slightly affected by ergot.

This species is manifestly closely related to *P. porphyroclados* and it is with some hesitation that I here maintain it as distinct, hoping that thereby it will engage the attention of collectors. Field studies, which I have not had the opportunity of carrying out in Western Australia, are necessary to ascertain whether it is in fact a distinct population, or whether the absence of web and glabrous lemma are merely trivial variants in *P. porphyroclados*.

20. P. porphyroclados *Nees* in Lehmann, Pl. Preiss. II (1846) 105.

LECTOTYPE: WESTERN AUSTRALIA: Nova Hollandia, Preiss No. 1820 (LE). I have been unable to locate this number in any herbarium other than Leningrad. SYNTYPE: WESTERN AUSTRALIA: Swan River, Drummond, in herb. Lindley (CGE).

Caespitose perennial with plentiful extravaginal innovations, the young shoots enclosed in broad scales, 45–90 cm. high. Culms more or less terete, lightly striate, smooth or almost so, 1- to 2-noded, the nodes glabrous. Sheaths minutely scaberulous. Ligule short, firm, minutely scaberulous. Blades inrolled and more or less terete or slightly expanded and narrow, about 13–40 cm. long, about 0·3–0·4 mm. diam., more or less smooth to the touch but seen to be very minutely scabrous to scaberulous at high magnifications (i.e. ca. × 40). Peduncle faintly scabrous below the panicle. Panicle about 10–22 cm. long, loose, with capillary branches, the lower whorl ca. 4-nate, unequal, all or the longer simple and devoid of spikelets in the lower half to two-thirds, the branches and pedicels finely scabrous. Spikelets light-greenish or purplish, 3- to 4-flowered, very compressed. Glumes 3-nerved, acute, moderately broad and moderately long to rather long, unequal with the upper a little longer and broader, minutely scabrous on the keels upwards. Web from rather copious to rather sparse. Lemma 3·2–3·75 mm. long, oblong-linear, 5-nerved, slightly or distinctly hairy on the keel and sometimes at the base of the lateral nerves, otherwise glabrous, obtuse to subacute. Palea linear to linear-lanceolate, finely scabrous on the keels in the upper two-thirds to three-quarters, glabrous or scabrous on the back. Anthers 2·2 mm. long, yellow or purplish tinted.

WESTERN AUSTRALIA: F. Mueller 16.12.1877 (MEL); A.G. Hamilton 1902 (NSW 50384); Muchea, F. Stoward 1.1916 (K); Claremont, near Perth, shady places, limestone, C. Andrews 14.10.1902 (K); Mt. Clarence, J. Staer 2.1911 (NSW 50934); Cottesloe, W.V. Fitzgerald 11.1900 (NSW 44634); Nuth Lake, Freemantle, J.G.C. Campbell 11.1923 (PERTH); Woodmans Point, near Coogee, C.A. Gardner 10.1942 (PERTH); Dwarda, A.T. O'Connell 11.1929 (K; PERTH); Clairs, Tambellup, per W.C. Grasby 5.1908 (NSW 9062; K); Harvey, F. Stoward 12.1916 (PERTH); Jardee, A. McNally 10.1949 (PERTH); Busselton, F. Stoward 11.1911 (NSW 9039a; K); Deep River, S.W. Jackson 12.1912 (NSW 9063; K); Banks of Blackwood, Oldfield (MEL); "Salt River", Cape Riche, G. Maxwell 1874 (K; MEL); King Georges Sound, J.H. Maiden 11.1909 (NSW 9098; K).

This species is very closely related to *P. labillardieri* and may, indeed, be merely the western form of that species. It usually differs in its smoother leaves and more abundantly produced extravaginal shoots. I have not seen it in the field and consider that further observation of it and comparison with the eastern *P. labillardieri* is required. Should the two be united, then the name *P. porphyroclados* would have priority. Some specimens from South Australia suggest that the two populations may intergrade in that area.

21. P. labillardieri *Steud.*, Syn. Pl. Gram. (1854) 262 (as *P. labillandieri*, sphalm.).

TYPIFICATION: *P. labillardieri* was described from a specimen in Labillardière's collections, presumably from Tasmania. Labillardière's chief collections are at Florence, but Dr. G. Moggi, Curator of the Herbarium Universitatis Florentinae, Istituto Botanico, Florence, has informed me that the Type is not at that institution. In the herbarium of the Royal Botanic Gardens, Kew, there is a specimen (collected by Labillardière and communicated by Webb) which agrees with Steudel's description, notably in the very scabrous leaves, and this I am accepting as being part of the Type Collection.

ORTHOGRAPHIC VARIANT AND MISAPPLICATION: "*P. billardieri* Steud." of Bentham's Fl. Austral. VII (1878) 651, is an orthographic variant of *P. labillardieri* Steud. The synonymy, description and specimens cited by Bentham are applicable to *P. poiformis* (Labill.) Druce, not to *P. labillardieri* as typified above.

Coarse, densely caespitose, green, glaucous or greyish, glabrous but generally scabrous perennial with mostly intravaginal, rarely extravaginal, innovations (rarely with deltoid or obtuse scales present), not or very rarely producing a rhizome (and then apparently in response to change of soil level), with a closely contracted rootstock. Culms 30–120 cm. high, usually terete and scabrous below the panicle. Leaves generally very long, mostly from the base of the plant. Sheaths usually pallid at the base, rarely slightly purplish or greenish, the lower sometimes rather broad and usually smooth, the upper more or less scabrous and sometimes rather glaucous. Ligule about 0·5 mm. long, minutely pubescent, truncate, minutely ciliolate at the apex. Blades up to 80 cm. long, flat and up to 3·5 mm. wide or often loosely to rather closely inrolled, more or less strongly antrorsely scabrous on the outer (lower) surface and margins, scabrous-pubescent on the inner surface, moderately rigid, tapering to a rather fine setaceous tip. Panicle 10–25 cm. long, rather narrow with erect or erectly and loosely spreading branches, the lower branches about 3-nate, unequal, more or less capillary and up to 12 cm. long, usually unbranched and devoid of spikelets for about half their length, the upper branches gradually shorter and more crowded and with spikelets almost to their bases, the branches and pedicels scabrous. Spikelets mostly 3– to 4– (rarely to 8–) flowered, greenish or purplish, strongly laterally compressed. Glumes usually rather long, broad to rather narrow, unequal with the upper a little longer, usually about three-quarters the length of the adjacent lemma, subacute to occasionally subacuminate, more or less scabrous on the keel and towards the apex. Web usually copious, consisting of long hairs. Lemma 2·5–4·5 (usually 3·5–4) mm. long, usually hairy on the keel in the lower half and on the lateral nerves towards the base, usually glabrous on the internerves but occasionally with a few loose hairs, minutely scabrous upwards, firm, narrow to moderately broad. Palea firm, at length equalling the lemma, closely scabrous on the keels in the upper two-thirds to three-quarters and smooth below or very rarely with a few cilia in the lower part, smooth, scabrous, scabrous-pubescent or pubescent on the back. "Tussock Grass". Fig. 1; Plate X, 2.

Widely distributed in the south-eastern quarter of Australia, chiefly in coastal and tablelands districts, but extending inland along river systems.

Queensland: Colroy Creek, Leichhardt (NSW 50833); F.M. Bailey No. 87, 1874 (MEL); Crediton, M.S. Clemens 11.1947 (BRI); Biggenden, Burnett district, common on border of *Eucalyptus* and rainforest, C.T. White No. 7248, 12.10.1930 (BRI; K); lower slopes of Mt. Ernest, in open forest, S.T. Blake No. 310, 8.10.1932 (K) and No. 301 (NSW 94290); Moreton district, Mistake Range, C.T. White 10.1920 (BRI; K); Mt. Mistake, C.E. Hubbard No. 5244, 24.11.1930 (K); Blackall Range, C.T. White 11.1916 (BRI); Cedar Creek, ca. 20 miles NW of Brisbane, common, forming tufts in dry rocky creeky bed, D.A. Goy & L.S. Smith No. 38, 19.12.1937 (BRI); Tambourine Mtn., C.T. White 1.1916 (BRI); Tambourine Mtn., J.H. Simmonds 10.1909 (BRI; K); Canungra, on south slopes of Mt. Tambourine, S.T. Blake No. 12853, 26.3.1937 (BRI); Tambourine Mountain, C.E. Hubbard No. 2434, 4.5.1930 (K); Enoggera Creek, F.M. Bailey 10.1875 (BRI); Brisbane River, F.M. Bailey (BRI); Mt. Mee near Dayboro ca. 1500 feet, S.T. Blake No. 12957, 3.5.1937 (BRI); near Samson Vale, S.T. Blake No. 196, 28.12.1931 (BRI; K); Killarney, C.T. White 25.11.1917 (BRI; K; NSW 50826); Wyberba, 2500–3000 feet, S.T. Blake No. 4562, 19.1.1935 (BRI); Spring Creek, near Killarney, ca. 1500 feet, C.E. Hubbard No. 5778, 13.3.1931 (K); Warwick, Beckler No. 21 (MEL); Macpherson Range, C.T. White 2.1912 (BRI); Running Creek, Lamington National Park, D.A. Goy & L.S. Smith No. 15, 24.10.1937 (BRI); Mt. Robert's, Lamington Plateau, very common in *Eucalyptus* forest, 2000–2600 feet, S.T. Blake No. 13155, 21.1.1937 (BRI); near Wallangarra, ca. 3000 feet, S.T. Blake No. 4452, 13.1.1933 (BRI); Snake Ridge, Roberts Plateau, D.A. Goy & L.S. Smith No. 82, 9.1.1938 (BRI).

New South Wales: Kyogle, N. Vane 12.11.1956 (NSW 50836); Clarence River, Wilcox 11.1875 (MEL; K); 5 miles S of Guyra on New England Highway, J. Vickery 9.1.1958 (NSW (50923); Ryanda, near Guyra, E.N. McKie No. 607, 16.11.1930 (BRI); Guyra, E.N. McKie No.609, 2.12.1930 (BRI); 5½ miles S of Guyra, R. Roe Nos. AR660, AR617, 13.12.1948 (CANB; NSW 51356, 51364); 5 miles S of Tenterfield, R. Roe No. AR650, 15.12.1948 (CANB; NSW 51357); Glen Innes Experiment Farm, R. Roe No. AR662, 15.12.1948 (CANB; NSW 51358);

25 miles NW of Guyra on Tingha road, R. Roe No. AR627, 13.12.1948 (CANB); 8 miles S of Guyra, J. Vickery 9.1.1958 (NSW 51192); Fairburn, E.N. McKie 5.1.1948 (NSW 50839); near Meldrum, Roe 1961 (NSW 56339); Hat Head Mtn., L.A.S. Johnson 24.10.1959 (NSW 50831); Cherry Hill, Uralla, R. Roe No. 675, 15.12.1948 (CANB; NSW 51360); Tamworth district, J.A. Loveridge 5.12.1955 (NSW 50835); Peel River, between Piallamore and Dungowan, near Tamworth, R.H. Goode No. 77, 6.11.1954 (NSW 50832); Caird's Gap, Liverpool Ranges, L.A.S. Johnson & E.F. Constable 31.10.1954 (NSW 50834); Coonabarabran, alluvial banks of Castlereagh River, C.K. Ingram 13.11.1958 (NSW 50901); 23 miles ENE of Coolah, R. Story No. 7051, 7.12.1959 (CANB); 20 miles N of Merriwa, R. Story No. 7000, 2.12.1959 (CANB); Hunter Valley above Murrurundi railway tunnel, R. Story No. 6918, 25.11.1959 (CANB); Upper Hastings River, J.H. Maiden 11.1897 (NSW 50840); 15 miles N of Nowendoc on Walcha road, J. Vickery 8.1.1958 (NSW 50924); 17 miles W of Yarras on Oxley Highway, large coarse tussocks in tall forest, J. Vickery 11.1.1958 (NSW 50926); 12 miles W of Yarras on Oxley Highway, J. Vickery 11.1.1958 (NSW 50925); Ellenborough River, 20 miles NW of Taree, E.F. Constable 17.11.1965 (NSW 100668); Yellow Rock, Nundle, E.N. McKie No. 608, 29.10.1930 (BRI); Tomalla Tableland, 4200 feet, R.W. Earp 30.1.1956 (NSW 50959, 50960, 50961); 17 miles N of Nowendoc on Walcha road, large tussocks at roadside, J. Vickery 8.1.1958 (NSW 51158); 5 miles N of Nowendoc, J. Vickery 7.1.1958 (NSW 51191); Williams River, J. Vickery 1.1930 (NSW 50951); Williams River Valley, near Barrington House, ca. 40 miles N of Singleton, ca. 1200 feet, glade in rainforest, R. Pullen No. 3771, 2.2.1963 (CANB; NSW 63647); W of Salisbury near top of divide between Williams and Allyn Rivers, J. Vickery 6.1.1958 (NSW 51190); Massey Creek State Forest, H. McDonald 2.1954 (NSW 50947); Rylstone, on banks of creek, C.K. Ingram 14.11.1960 (NSW 53491); Neville district, R.C. Madsen 12.12.1950 (NSW 50967, 51024). Blayney, C.K. Ingram 4.12.1958 (NSW 51210); Meadow Flat-Portland road junction, C.K; Ingram 21.10.1958 (NSW 53495); between Oberon and Duckmaloi River, J. Vickery 3.1.1955 (NSW 50838); near Oberon on Hampton road, J. Vickery 3.1.1954 (NSW 50837); Oberon, 4000 feet, E.F. Constable 9.3.1950 (NSW 50841); Norway near Oberon, J. Vickery 3.1.1955 (NSW 50843); near Duckmaloi River on Oberon-Hampton road, J. Vickery 3.1.1954 (NSW 50844); between Norway and Beaconsfield on Oberon-Goulburn road, J. Vickery 25.1.1959 (NSW 50849); Oberon, A.J. Anderson 11.1949 (CANB); near Hampton, on Oberon road, J. Vickery 3.1.1955 (NSW 50845); between Hampton and Oberon near junction with Jenolan road, in forest near swamp, J. Vickery 30.1.1956 (NSW 50962); Cox's River, D.L.W. Henderson No. 404, 12.1.1948 (NSW 50963); Port Jackson, R. Brown 1802–5 (NSW 50940); Kogarah West, J.H. Camfield 11.1893 (NSW 50941); Prospect, J. Vickery 2.5.1931 (NSW 50949); Colo, E. Cheel 13.11.1911 (NSW 9069; K); Audley, National Park, J. Vickery 15.12.1956 (NSW 50884); National Park, J. Vickery 15.12.1956 (NSW 50882, 50883, 50885); National Park, O.D. Evans 12.1929 (SYD); Campbelltown, T.V. Atkins (K; BRI); near Helensburgh, H. Salasoo No. 1544, 27.12.1957 (NSW 50880); between Stanwell Park and Otford Stations, H. Salasoo No. 1269, 27.12.1954 (NSW 50886); Macquarie Pass, R. Pullen No. 2526, 4.1.1961 (CANB; NSW 57297); Yellow Rock Creek near Albion Park, R. Pullen Nos. 4242, 4249, 13.12.1966 (NSW 84479, 101137; CANB); Nattai River near Hilltop, E. Cheel 1.1912 (NSW 50877); Mittagong, W. Dunn 12.1918 (NSW 50939); Bungendore district, T.F. Rutledge 13.12.1956 (NSW 51019); near Mt. Keira on Bulli Pass road, H.K. Mair & E.F. Constable 8.11.1959 (NSW 16083); on descent from Fitzroy Falls to Kangaroo Valley, near rainforest, J. Vickery 5.1.1959 (NSW 50879); Bowral, near summit of the Gib, 2800 feet, F.A. Rodway 15.12.1935 (NSW 50846) and 17.11.1935 (K); 8 miles SE of Bowral, J. Vickery 5.1.1959 (NSW 50864); Cambewarra Range near Bellawangra, F.A. Rodway 29.10.1939 (NSW 50881; K); Meroo, between Nowra and Berry, F.A. Rodway 23.11.1936 (K; NSW 50955); Huskisson, Jervis Bay, F.A. Rodway 15.12.1939 (NSW 50953); Milton, R.H. Cambage No. 2160, 12.1888 (NSW 50876); Nelligen, E.F. Constable 13.12.1950 (NSW 16636); between Braidwood and Major's Creek near Shoalhaven River crossing, J. Vickery 12.1.1956 (NSW 51022); Canberra, R.H. Cambage No. 2963, 5.11.1911 (NSW 50891; SYD); Canberra, J. Vickery 15.11.1931 (NSW 50893); Devil's Creek, E. Gauba 13.1.1950 (CBG 003025; ANU); Black Mountain, E. Gauba 12.12.1949 (CBG 003402, 003401; ANU); Molonglo River, on sandbanks, E. Gauba 17.12.1949 (CBG 003400); top of Fitz's Hill, A.C.T., N.T. Burbidge & M. Gray No. 4188, 23.12.1958 (CANB; NSW 51340); Burbong, H.S. McKee No. 7542, 5.11.1960, large clumps on river bank (NSW 52872, 56351); Burbong, Kowen district, on slopes near river, ca. 2250 feet, R. Pullen No. 2487, 20.12.1960 (CANB; NSW 56439); Bendora to Mt. Franklin, ca. 4900 feet, hilly granite country near small running creek, N.T. Burbidge & M. Gray No. 4447, 17.1.1958 (CANB; NSW 50900); Uriarra Crossing, Murrumbidgee River, N.T. Burbidge No. 1821, 13.1.1948 (CANB; NSW 50917; K); entrance to Gudgenby Station, river bank near water, N.T. Burbidge & M. Gray No. 6204, 23.12.1958 (CANB; NSW 51341); Boboyan road, S of Gudgenby, at the Naas Creek Crossing, ca. 3600 feet, R. Pullen Nos. 2579, 2580, 23.1.1960 (CANB; NSW 56535, 56543); Malua Bay, S of Batemans Bay, behind beach, J. Vickery 6.1.1959 (NSW 50862); W of Wimbie Beach, S of Batemans Bay, J. Vickery 6.1.1959 (NSW 50860, 50861); between Bredbo and Jerangle, J. Vickery 11.1.1956 (NSW 50892); between Queanbeyan River and Jerangle on Captains Flat road, J. Vickery 5.1.1956 (NSW 50914, 51021); N of Captains Flat between Hoskinstown and Foxlow, J. Vickery 4.1.1956 (NSW 51025); ca.

2 miles from Captains Flat on Braidwood road, J. Vickery 12.1.1956 (NSW 51020); 30 miles SE of Deniliquin, J.H. Leigh 17.11.1964 (NSW 65845); near Narooma, H.S. McKee No. 6899, 1.1.1960 (NSW 50848); Wagonga, near Narooma, F.A. Rodway 24.12.1928 (NSW 50878); Tilba, E. Breakwell 12.1913 (NSW 50933); Cobargo, E. Breakwell 12.1913 (NSW 50932); Queanbeyan, S. Reid 13.12.1955 (NSW 51023); Cooma, near aerodrome, M.E. Phillips 2.12.1955 (NSW 50968); Snowy Mountains Highway, ca. 15 miles and ca. 17 miles N of Cooma, J. Vickery 22.1.1958 (NSW 50920, 50922); 6 miles NNE of Rules Point, ca. 4400 feet, B.G. Briggs 25.12.1960 (NSW 52861); Boundary Creek on Rules Point to Brindabella track, M.E. Phillips 8.2.1956 (NSW 50911); Tumut district, Piper 2.12.1959 (NSW 50913); Clear Creek Camp, Tumut Pond, M.E. Phillips 3.2.1956 (NSW 50907); Tumut Pond Camp, J. Vickery 20.1.1958 (NSW 50908); Kings Cross, ca. 8 miles WSW of Kiandra, J. Vickery 20.1.1958 (NSW 50909); Waterfall Creek, M.E. Phillips & J. Raeder-Roitzsch 10.1.1957 (NSW 50910, 50912); near Jindabyne, J. Vickery & M.E. Phillips 6.1.1956 (NSW 50915); Jindabyne Camp, M.E. Phillips 2.12.1955 (NSW 50890); Bugtown, ca. 16 miles ESE of Kiandra, J. Vickery 22.1.1958 (NSW 50921); Bowna, ca. 25 miles NE of Albury, C.K. Ingram 11.11.1958 (NSW 51028); Barooga, on bank of Murray River, J. Vickery 11.10.1949 (NSW 50902); Tulla, on levee bank of Wakool River, D.L.W. Henderson No. 116, 23.11.1945 (NSW 50903); N of Tanja on Bermagui to Bega road, J. Vickery 6.1.1959 (NSW 50857); Brockelo's Creek on Bermagui to Tanja road, J. Vickery 6.1.1959 (NSW 50853, 50863); ca. 4 miles E of Bega on Tanja road, J. Vickery 6.1.1959 (NSW 50854); ca. 4 miles from Tanja on Bega road, J. Vickery 6.1.1959 (NSW 51027); on lower slopes of Tantawanglo Mountain, J. Vickery 6.1.1959 (NSW 50856); between Tantawanglo Mountain and Cathcart, J. Vickery 7.1.1959 (NSW 50855); Tantawanglo Mountain, on hill W of 6-Mile Creek, and at 6-Mile Creek, J. Vickery 7.1.1959 (NSW 50852, 50851); Cathcart, J. Vickery 13.1.1940 (NSW 50895) and 14.1.1940 (NSW 50948); Eden, Twofold Bay, E. Cheel, 18.12.1903 (NSW 9106; K).

Victoria: Vermont, P.R.H. St. John 8.12.1902 (MEL); near Dimboola, No. 21 (MEL); Bandiana, E.J. McBarron No. 2596, 14.11.1948 (NSW 50904); ca. 5 miles from Omeo on Hotham road, J. Vickery 11.1.1959 (NSW 50850); Swifts Creek to Omeo, F. Robbins ca. 1937 (ACB 7421; NSW 85574); Cann River, N.A. Wakefield No. 2121, 25.11.1947 (NSW 50956); Lindenow Flat, Mitchell River (MEL); Fraser National Park, on western side of Eildon Reservoir, T.B. Muir No. 3589, 29.10.1964 (MEL; NSW 85386); Loddon River, C. Walter 11.1887 (NSW 50905); Naree Warren, J. Staer (NSW 50957); Lilydale, A.H.S. Lucas (NSW 51175); Melbourne, W.B. Guilfoyle 6.1879 (BRI); Broadmeadows, near Melbourne, L.S. Smith No. M90, 11.1943 (BRI); Yarra, Mueller (K); Port Phillip, F. Reader (MEL); Point Lonsdale, J.E. Tilden Nos. 712, 817, 10–11.1912 (K); French Island, P. Beveridge (MEL; K); Barwon River, Geelong, J.B. Wilson No. 7, 10.1881 (K); Apollo Bay, M. Tindale 3.3.1966 (NSW 100667); Wando Vale, Robertson No. 540 (K); Fyans Creek at Halls Gap Valley, The Grampians, in sand banks along creek, tall vigorous clumps, D. Symon No. 1863, 7.11.1961 (ADW 24441; NSW 57130).

Tasmania: Gunn No. 595 in part (K), cited by Hooker, Fl. Tas. II (1858) 124 as *P. affinis* R. Br.; Gunn No. $\frac{1012}{1837}$, 8.1.1838 (K), this number cited by Nees in Lond. Journ. Bot. II (1843) 418 as *P. australis* R. Br., and by Hooker, Fl. Tas. II (1858) 124, as *P. affinis* R. Br.; Gunn No. 596? (K); Archer (NSW 42402); D. Martin 1938 (NSW 53035); CH (? Circular Head), Gunn No. 596, 19.12.1837 (K); Sand Neck, Gunn No. $\frac{1012}{1887}$, 8.1.1838 (NSW 42397); Honeywood, Blyth (MEL); Boat Harbour, N of St. Helens, wooded slope above coastal heath, N.T. Burbidge No. 3097, 11.1.1949 (CANB; K; HO); 6 miles E of Launceston on exposed ridge, N.T. Burbidge No. 2932, 8.1.1949 (CANB; K; HO); foothills of Mt. Barrow in wet sclerophyll forest, N.T. Burbidge No. 2974, 8.1.1949 (CANB; K; HO); Mt. Barrow, T.E. Burns 7.1.1936 (NSW 53036); Deloraine, K. Blackwood 20.1.1930 (HO); near Duck River on road to Cradle Mountain, in alpine pasture, N.T. Burbidge No. 3510, 31.1.1949 (CANB; K; HO); Cradle Valley, G. Weindorfer 1.1914 (NSW 42398); near Ross 16.11.1887 (MEL); 17 miles from Ross on Cressy road, in woodland of *Eucalyptus*, *Banksia* and *Casuarina*, N.T. Burbidge No. 3550, 2.2.1949 (CANB; HO; K; NSW 43043); Shannon River at Great Lake, banks of river, N.T. Burbidge No. 3435, 28.1.1949 (CANB; HO; K); Great Lake, 35 miles from Bronte Park, ca. 3600 feet, M.E. Phillips No. 390A, 24.1.1962 (CBG 003183; NSW 63675); Waratah, A.H.S. Lucas 12.1924 (NSW 42401); 9 miles N of Waratah, open sclerophyll forest, N.T. Burbidge No. 3494, 31.1.1949 (CANB; HO; K); St. Valentines Peak, ca. 1500 feet, at top of "White Grass" plain, M.E. Phillips No. 446, 26.1.1962 (NSW 56964); The Hummocks region near Guildford in logged forest, M.E. Phillips No. 429, 26.1.1962 (NSW 56965); Wandle River on Waratah road, M.E. Phillips No. 416, 26.1.1962 (NSW 56967); Pieman River, West Coast, G. & C. Davis No. 2453, 7.1.1937 (K; NSW 42399); near Bronte Park, 1500 feet, M. Tindale 16.12.1954 (NSW 50693); top of range near Victoria Valley, M.E. Phillips Nos. 282, 284, 22.1.1962 (CBG 003184; NSW 56971, 63677); plain between Ouse and Osterley, M.E. Phillips No. 279, 22.1.1962 (NSW 56972); 5 miles S of junction of Tarraleah and main Derwent Bridge roads, N.T. Burbidge No. 3324, 24.1.1949 (CANB; HO; K); Orford, W.M. Curtis 1.1949 (HO; K); Hobart town, not common, stony situations on banks of creeks, S. Hannaford ca. 1870 (MEL; K); Hobart, A H.S.

Lucas 12.1923 (NSW 39017); Sandy Bay, A.H.S. Lucas 11.1924 (NSW 39021); head of Ralphs Bay, near Hobart, edge of saltmarsh, M.E. Phillips No. 408, 8.11.1960 (NSW 52981); Pontville, A.H.S. Lucas 12.1924 (NSW 53033, 53034); Domain, Hobart, W.M. Curtis 16.12.1943 (HO; K); Mt. Wellington, D. Martin 12.1933 (NSW 50694, 53037); Boomer, near Dunally, stabilised saltmarsh, W.M. Curtis 20.11.1943 (HO; K); Little Boomer, sandy spit running into salt water, W.M. Curtis No. 205 (K); Port Arthur, roadside through open eucalypt forest, green erect tufts 30–60 cm. high, S.T. Blake No. 18298, 15.1.1949 (BRI; NSW 57161); Huonville, D. Martin (CANB).

SOUTH AUSTRALIA: Wandilo, I.B. Wilson No. 629, 5.11.1966 (AD; NSW 85372); Flinders Ranges, Melrose, foothills of Mt. Remarkable, S.T. Blake No. 16933, 2.9.1946 (BRI); Flinders Range, Wilpena Pound, J.B. Cleland 10.11.1928 (AD); Mt. Lofty Ranges, Stonyfell foothills in grassy area, J.B. Cleland 30.11.1958 (JBC); Hallett, J.B. Cleland 10.11.1938 (BRI); Reedbeds near Adelaide, 23.11.1879 (AD); Halls Creek, Encounter Bay, J.B. Cleland 1.1.1953 and 28.12.1953 (AD); Lake Bonney, J.B. Cleland 7.12.1922 (AD).

Hooker, Fl. Tas. II (1858) 124, incorrectly referred specimens of this species to *P. affinis* R. Br. Nees in Lond. Journ. Bot. II (1843) regarded it as a variety of *P. australis* R. Br. (a nomenclatural synonym of *P. poiformis* (Labill.) Druce.

Spikelets in the "viviparous" condition have been observed in a few specimens of this species.

This species, as represented by the specimens cited above, is the common, large, tussock-forming *Poa* of river flats (both alluvial and gravelly), or of otherwise reasonably moist situations in eastern Australia. In coastal and tablelands areas it may also be found in or along the margins of forests and extending up open sheltered slopes particularly those which face towards the south, while it may occur in any exposed soakage areas or drainage channels, but it seldom occurs in really well drained, dry situations. It is widespread from sea-level to altitudes of about 5,000 feet.

The population is generally easily recognisable in the field, but so much variation occurs between individual specimens, especially when reduced to the size of a herbarium sheet, that its exact characterization is a matter of considerable difficulty. I have repeatedly worked through a large series of specimens and as frequently found it impossible to obtain meaningful results from attempts to segregate forms on the basis of these variable characteristics. With misgivings, an exception has been made in the case of the variety described at the end of these notes. Taken individually some of these characters seem to break down the distinctions between *P. labillardieri* and several other related species, but the associated characters usually enable any plant to be satisfactorily placed. Considerable field observation has convinced me that these variations must be accepted as inherent in the population.

P. labillardieri of eastern Australia seems closely related to *P. porphyroclados* of Western Australia, differing chiefly in the usually very scabrous leaves. Occasionally, however, an almost smooth-leafed plant is encountered amongst the eastern population and the degree of roughness is very variable. Nevertheless I have felt it best to treat the two populations as distinct at least until *P. porphyroclados* is better known and until our basic understanding of the biology of the group is far greater than it is at present. It should be noted that, if the two are united, the name *P. porphyroclados* would have priority.

Field observations indicate that *P. poiformis* occurs only in sites adjacent to the ocean and estuaries where it is under some degree of influence of salt spray. From the landward side *P. labillardieri* approaches and may even intermingle with it. I have usually had no difficulty in distinguishing them in the field by the smoothness and slightly greater succulence of the leaves of *P. poiformis* and its more dense, contracted panicles with usually rather larger spikelets and lemmas and rather rougher (with stone cells) lemmas. There is no doubt that occasional herbarium specimens can be distinguished with great difficulty if at all. To some extent at least this may be a reflection on the quality of the specimen and the care with which it was selected rather than upon the reality of the existence of the two populations.

Although extravaginal as well as intravaginal shoots are certainly developed in *P. labillardieri* and traces of the first scale leaves are not infrequently present at the base of the culms in herbarium specimens, all shoots seem to develop from the base of the plant and I have not observed stolons or fascicles of aerial shoots in this species such as occur in *P. affinis*. The plant forms a dense tussock with a contracted rootstock and the development of an elongated rhizome is extremely rare though not entirely unknown; it is believed that such develops only as a response to an abnormal change of soil level and I have, for instance, observed rhizomes on a plant partially buried by a road-grader. In this respect, amongst others, it differs from *P. ensiformis* in which rhizome development to initiate new tussocks remote from the parent plant is a frequent and characteristic phenomenon. Similarly *P. labillardieri* lacks the short scaly rhizomes characteristic of *P. cheelii.*

The blades, though not broad, may be flat and expanded or more or less loosely or rather closely inrolled, both conditions often apparent on the one plant, but the inrolled appearance is more commonly in evidence in dried specimens. The more luxuriant the habitat, the broader and more expanded some, at least, of the leaves will be, and the more closely the plant will resemble *P. helmsii*. When growing under drier conditions near the limit of its tolerance, plants may be stunted and blades so tightly inrolled as to simulate the appearance of *P. sieberana*. In one extreme instance transplant experiments conducted by Dr M.E. Phillips at Cooma were necessary to demonstrate the identity of some unusually stunted plants that had extended from a soakage area up into adjacent dry pasture land as *P. labillardieri*; comparable stunted plants have been seen on many other sites.

The lower leaf sheaths are ordinary pale in colour but an occasional specimen may be lightly tinted with purple; this also may cause some confusion between *P. labillardieri* and species such as *P. ensiformis*.

Breadth and length of the glumes is subject to considerable variation, and also the length of the lemma. The latter is typically narrowly oblong and may be long enough to be well within the size range of the large-flowered *P. poiformis*. but other specimens, particularly some from the central and northern parts of New South Wales and in Queensland, are shorter and therefore proportionately broader, so that they fall well within the range of the small-flowered *P. sieberana*. Further confusion with the latter may occur in the rare instances when hairs are developed on the internerves of the lemma but this condition has been observed chiefly on large-flowered specimens on coarse tussocks that would not readily be mistaken for *P. sieberana*. The keels of the palea may be from very finely to coarsely scabrous and in extremely few specimens the lower asperities are elongated to a stage barely distinguishable from the condition of being scabrous above and finely ciliolate below which is found in *P. sieberana* and certain other species. The back of the palea is typically glabrous or only slightly scabrous but in a proportion of specimens it is distinctly more pubescent.

With adequate moisture the inflorescences are large with long branches. Under drier conditions they may be greatly reduced in size and "out-of-season" panicles could look very different in this respect from those produced by the same plant at the main flowering time under good conditions.

Considerable variation is undoubtedly due to habitat and seasonal factors but some must be due to genetic factors which await elucidation.

var. **acris** *Vickery*, **var. nov.**

A typo vaginis inferioribus plus minusve purpurascentibus, laminis brevioribus rigidioribusque, semper convolutis, firme cuspidatis, saepe plus minusve caerulescentibus differt.

Holotype: Tasmania: At foot of Valentine's Peak, at level of "White Grass" plain, subalpine, M.E. Phillips No. 448, 26.1.1962 (NSW 63718; Isotype CBG 003036).

Differs from the type in the following combination of characters: Lower sheaths more or less purplish; blades often shorter and more rigid, always convolute, firmly pointed, often more or less bluish.

Tasmania: Waldheim, ca. 3000 feet, M.E. Phillips No. 458, 27.1.1962 (CBG 003102; NSW 64694) and No. 464 (CBG; NSW 64695); above Great Lake, on Deloraine end, ca. 3600 feet, M.E. Phillips No. 397, 24.1.1962 (CBG 003179; NSW 63719); Great Lake, 30 miles from Bronte Park, ca. 3600 feet, M.E. Phillips No. 388, 24.1.1962 (CBG 003188; NSW 63721); Great Lake, 18 miles from Bronte Park, ca. 3400 feet, M.E. Phillips No. 384, 24.1.1962 (CBG 003092; NSW 63720); S of Great Lake, 13 miles from Bronte Park, ca. 3200 feet, subalpine snow-grass plain, M.E. Phillips No. 380, 24.1.1962 (CBG 003181).

This variety seems to bear a similar relationship to *P. labillardieri* as does *P. phillipsiana* to *P. sieberana* on the mainland and, when first collected, was thought to be *P. phillipsiana.* However the characters of the spikelets resemble those of *P. labillardieri* rather than of *P. phillipsiana.* In the Holotype the vegetative differences from *P. labillardieri* are so marked that it would appear as worthy of specific rank as various other taxa so recognised in this study; however, it seems to be connected by so many intermediates that I have preferred the lower category at least until the Tasmanian populations are better understood.

22. P. helmsii *Vickery*, sp. nov.

Gramen perenne, definite caespitosum, amplum, basi foliosum foliis latiusculis, surculis arcte appressis intravaginalibus vel infrequente extravaginalibus ex rhizomate contracto (haud elongato) verticale vel obliquo, plerumque 50–150 cm. altum, in sitis humidis saepe prope flumines parva ad altitudines alta incolens. Culmi plus minusve valde compressi et aliquanto ancipites, robustiusculi, in speciminibus validis usque ad 6 mm. latitudino, internodis striatis, saepe sursum scabri, praesertim sub paniculum compressi scabrique. Nodi glabri. Vaginae latae, sursum valde compressae carinataeque, pallidiusculo-virides, haud vel rarissime purpurascentes, striatae, dense scabridae vel scabrae, tandem laxae. Ligula 0·5–2 mm. longa, firma, truncata, ad apicem minute ciliolata, ad dorsum puberula. Laminae planae vel in sicco aliquando plicatae vel subconvolutae, 15–50 (raro–80) cm. longae, 3–8 mm. latae, lineares, ad apices acutos carinatos breviuscule angustae, in vivo pallidiusculo-virides, valde striatae, scabrae, nervis lateralibusque prominentibus, nervo medio manifesto et linea duo subtranslucentes marginato, marginibus scabris. Panicula ampla, usque ad 35 cm. longa, plus minusve lanceolata, ramis plerumque hinc patentibus, inferioribus usque ad 7–natis, inaequalibus, longissimis usque ad 12 cm. longis, basi nudis ramulos spiculasque plerumque apices versus ferentibus, ramulis secundariis superioribus sursum gradatim brevioribus densioribus, rhachide ramis ramulis pedicellisque scabrissimis. Spiculae 3–8–flores, plerumque pallido-virides, rarissime paulo purpurascentes. Glumae obtusae vel acutae vel breve acuminatae, 3–nervatae, inaequales, ad carinas et saepe sursum ad latera scabrae, ca. $\frac{1}{2}$–$\frac{2}{3}$ longitudinis lemmatis proximi, inferior non lata, superior modeste lata. Aranea plerumque modeste copiosa. Lemma 2·75–3·75 mm. longa, ex latere plus minusve lanceolata, parce lata, obtusa, 5–nervata, in dimidio inferiore ad carinam et basi ad nervos laterales sed non ad margines tenuiter pilosa, internervis glabris vel

rarissime paulo pubescentibus. Palea ad carinas supra tenuiter scabra, basin versus laevis, ad dorsum glabra. Antherae 3, 2 mm. longae, flavescentes vel leviter purpurascentes.

HOLOTYPE: NEW SOUTH WALES: Mt. Kosciusko, Pretty Point, at 5000 feet, R. Helms 2.1893 (NSW 44113).

Coarse, rather broad-leafed, strictly caespitose perennial with intravaginal and (less frequently) extravaginal, closely appressed shoots from a condensed, often more or less vertical or oblique rootstock (without spreading horizontal rhizomes, although occasionally an obliquely ascending rhizome may develop in response to change of soil level or from the interior of the tussock towards the exterior), mostly 50–150 cm. high, leafy at the base, inhabiting rather wet situations at high elevations often near streams. Culms more or less strongly compressed and sometimes 2-edged, coarse and up to 6 mm. wide in vigorous specimens, the internodes striate and often scabrous upwards. Nodes glabrous. Sheaths broad, strongly compressed and keeled upwards, pale greenish (not or very rarely purplish), striate, closely scabrid to scabrous, becoming loose. Ligule 0·5–2 mm. long, firm, truncate, minutely ciliolate at the apex, puberulous on the back. Blades flat, or becoming folded or with somewhat inrolled margins on drying, 15–50 (rarely –80) cm. long, 3–8 mm. wide, linear, rather shortly narrowed into the acute keeled apex, light-greenish when fresh, strongly striate, scabrous, the nerves prominent, the midrib manifest and margined by two subtranslucent lines, the margins scabrous. Peduncle often more or less strongly compressed and scabrous below the panicle, often robust (up to 3 mm. wide). Panicle large, up to 35 cm. long, more or less lanceolate, the branches falling mostly towards one side, the lower branches up to 7-nate, unequal, the longest up to 12 cm. long, bare at the base with the secondary branches and spikelets mostly towards the ends, the upper "whorls" of branches progressively shorter and more crowded, the rhachis, branches and pedicels very scabrous. Spikelets 3- to 8-flowered, usually light greenish, very rarely slightly purplish-tinted. Glumes obtuse to acute or shortly acuminate, 3-nerved, unequal, scabrous on the keel and often upwards on the sides, half to two-thirds as long as the adjacent lemma, the lower not broad, the upper only moderately broad. Web usually well developed. Lemma 2·75–3·75 mm. long, more or less lanceolate (when viewed from the side), not very broad, obtuse, 5-nerved, lightly hairy on the keel in the lower half and at the base of the lateral nerves but not on the margins, glabrous on the internerves or very rarely slightly pubescent. Palea finely scabrous on the keels in the upper two-thirds to three-quarters and smooth below, glabrous on the back. Anthers 3, 2 mm. long, yellow or slightly purplish-tinted. Locally known as "Broad-leafed Snow Grass". Plate IX, 3.

In wet places chiefly in the Australian Alps of New South Wales and Victoria and on the adjacent ranges.

NEW SOUTH WALES: Mt. Franklin, A. Melvaine 3.1939 (NSW 44109); between Mt. Franklin and Bulls Head, N.T. Burbidge No. 2813, 23.3.1948 (CANB; NSW 51239); Coree (Brindabella Range), R.H. Cambage No. 3313, 9.12.1911 (NSW 44098); about 1 mile below Upper Cotter Dam site, ca. 2300 feet, R. Pullen No. 1257, 11.1.1959 (CANB); Coree Creek at Five Fords, large coarse tussocks with flat leaves growing at water's edge, N.T. Burbidge No. 1831, 13.1.1948 (CANB; K); Five Fords, between Canberra and Mt. Franklin, J. Vickery 25.1.1964 (NSW 67694); saddle to S of Mt. Coree, Brindabella Range, ca. 3700 feet, R. Pullen No. 2537, 10.1.1961 (CANB; NSW 56530); 5 miles SSW of Brindabella, ca. 2200 feet, on moist river bank under tall sclerophyll forest, B.G. Briggs, 26.12.1960 (NSW 52866); Fishing Gap, Tidbinbilla, ca. 4000 feet, few tall culms and little basal growth, damp ground along creek, N.T. Burbidge No. 2763, 27.1.1948 (CANB; K); Fishing Gap, west side, ca. 4000 feet, Mt. Tidbinbilla, tall tufted grass, light green leaves with flat blades, edge of creek, N.T. Burbidge No. 2765, 27.1.1948 (CANB); Tidbinbilla, in a creek in forest, E. Gauba 21.1.1953 (CBG 003404; ANU); ca. ½ mile S of Snowy Flat, on E side of Mt. Gingera, Bimberi Range, ca. 5500 feet, R. Pullen No. 3076, 28.2.1962 (CANB; NSW 57345); slopes of the Upper Cotter Valley below Mt. Aggie, Brindabella Range, side of small semi-permanent watercourse in tall eucalypt woodland, ca. 3900 feet, R. Pullen Nos. 2984, 2985, 6.12.1961 (CANB; NSW 57305, 57306); Snowy Flat, 5500 feet, E. Gauba 27.1.1953 (CBG 003037); Mt. Campbell, E. Gauba 7.12.1949 (CBG 003040; ANU); Mt. Gingera, 5500 feet, on bank of creek, E. Gauba 17.2.1950 (CBG 003039; ANU); Mt. Gingera, on creek bank, M.E. Phillips 20.2.1963 (CBG 003034; NSW 59137); Badja, woodland, E. Gauba 6.7.1950 (CBG 003038); Bimberi Range, between Mts. Gingera and Ginini, ca. 5600 feet, open damp hollow in eucalypt woodland, R. Pullen No. 3839, 27.2.1963 (CANB; NSW 63648); Mt. Gingera, 1700 m., H.S. McKee No. 10379, 27.2.1963 (NSW 66337); Devils Creek, E. Gauba 13.1.1950 (CBG 003027; ANU); Captains Flat, 7.1.1924 (NSW 60215); Munderoo State Forest, E.J. McBarron No. 1328, 4.1.1948 (EJMcB); 6-Mile Creek, Tantawanglo Mountain, J. Vickery 7.1.1959 (NSW 46821); cult. at Cooma from plant from near Island Bend, M.E. Phillips & S. Smith-White 8.12.1955 (NSW 44097); cult. at Cooma from plant from near Island Bend, M.E. Phillips & J.C. van Lint 6.12.1955 (NSW 44110); Cooma district, A.C. Taylor 5.2.1953 (NSW 44108); cult. at Cooma from plant from Wragges Creek, Kosciusko Plateau, M.E. Phillips & S. Smith-White 8.12.1955 (NSW 44104); cult. at Cooma from plant from Gibbo River, J. Vickery & M.E. Phillips 25.11.1959 (NSW 50294); near Brungle Creek bridge on the Tumut-Wee Jasper road, tall tussock grass in creek bed, R. Pullen No. 1988, 22.11.1959 (CANB); Paddys River Falls, Tumbarumba, ca. 2500 feet, E.J. McBarron No. 7397, 3.1.1963 (NSW 59093); McKeannies Creek, Upper Tumut, J.C. Newman 1.1952 (NSW 44099); Snowy Valley road, between Island Bend and Kosciusko turn-off, on hillside in slight soakage area, J. Vickery & M.E. Phillips 11.1.1956 (NSW 41565); Eucumbene River, M. Mueller 17.11.1952 (NSW 51236); Jindabyne to Rennix Gap road, M.E. Phillips 2.12.1955 (NSW 44111); Sawpit Creek, ca. 5000 feet, coarse tall tussocks beside creek, J. Vickery & M.E. Phillips 11.1.1956 (NSW 41566); Island Bend Camp, M.E. Phillips 30.11.1955 (NSW 44096); Island Bend district, in swampy patch in cleared forest, M.E. Phillips 7.12.1954 (NSW 44103); near Island Bend at Diggers Creek, large coarse tussocks beside creek, J. Vickery & M.E. Phillips 8.1.1956 (NSW 41568); Snowy Valley road, in forest, M.E. Phillips 2.12.1955 (NSW 44112); Snowy Mountains, Kings Cross to Cabramurra road, M. Mueller 15.12.1954 (NSW 44105); Cabramurra area at T2 access track at 2400 feet, M.E. Phillips 1.2.1956 (NSW 44095); Cabramurra region, T2 camp, M.E. Phillips 1.2.1956 (NSW 44094); near Kiandra, J. Vickery 20.1.1958 (NSW 44104), affected by a smut; ridge above Happy Jacks township, ca. 12 miles S of Kiandra, large tussock beside creek, J. Vickery 20.1.1958 (NSW 44101); Lobs Hole, M.E. Phillips & J. Raeder-Roitzsch 8.12.1959 (NSW 48981); near old Hotel Kosciusko site, ca. 5000 feet, in wet situation, J. Vickery & M.E. Phillips 7.1.1956 (NSW 41567); Kosciusko, in damp spot above Hotel, R.H. Cambage No. 4314, 15.2.1920 (NSW 44100); Diggers Creek, near Hotel Kosciusko, 5000 feet, on granite soil, L.A.S. Johnson & E.F. Constable 20.1.1951 (NSW 15974); Kosciusko, 5500 feet, J. Vickery 14.1.1940 (NSW 9041; K); Mt. Kosciusko, 6000–7000 feet, R. Helms 2.1901 (NSW 44107); Mt. Kosciusko, tree-line to 7000 feet, Maiden & Forsyth 1.1899 (NSW 44106); Alpine Highway in Crackenback Valley, M.E. Phillips 25.1.1956 (NSW 41569); Geehi River track, below The Pinnacle track, W of Mt. Townsend, J. Vickery 9.1.1959 (NSW 46823); Upper Humes (Murray) River, 3–4000 feet in forests and on rivulets, F. Mueller 1.1874 (MEL).

VICTORIA: In springy hillside, 5000 feet, A.J. Tadgell 12.1921 (MEL); near headwaters of Nightingale Creek, 3 miles SW of Mt. Wellington, T.B. Muir No. 3117, 3.1.1964 (MEL; NSW 85371); ca. 1 mile S of Gibbo Creek bridge on Nariel to Omeo road, coarse tussocks on river flat under trees, J. Vickery 11.1.1959 (NSW 46824); near junction of Gibbo Creek and Mitta Mitta River, large, broad-leafed tussocks beside small creek, J. Vickery 11.1.1959 (NSW 46828); on the Omeo-Corryong road at Willow Crossing on Nariel Creek, T.B. Muir No. 3691, 3.12.1964 (MEL; NSW 85380); ca. 8 miles WSW of Omeo on Hotham road, beside small creek, J. Vickery 11.1.1959 (NSW 46818); between Omeo and Hotham Heights, in wet depression, J. Vickery 11.1.1959 (NSW 46817); Mt. Loch, E. Gauba 9.2.1955 (CBG 003403; ANU); ca. 3 miles E of Germantown on Bright-Tawonga road, large coarse tussocks in valley near creek under forest, J. Vickery 13.1.1959 (NSW 46827); Mt. Buffalo, ca. 5000 feet, large tussocks at edge of creek, on road to reservoir, J. Vickery 13.1.1959 (NSW 46825); Mt. Buffalo, ca. 5000 feet, single large tussock in swampy creek near The Lake, J. Vickery 13.1.1959 (NSW 46826); source of Buffalo Creek, Mt. Buffalo National Park, J.H. Willis 20.2.1963 (MEL; NSW 85548); ca. ½ mile from top of penstock at McKay Portal, above McKay Creek, N of Bogong High Plains, in damp position on road batter, J. Vickery 14.1.1959 (NSW 46820); near Turnback Creek, N of Bogong High Plains, ca. 4000 feet, in forest on hillside, J. Vickery 14.1.1959 (NSW 46822); Bogong High Plains, Towong Huts, A.C. Beauglehole No. 22492, 25.1.1967 (NSW 85452); between Mt. Beauty and Falls Creek, Clover Dam area, A.C. Beauglehole No. 22443, 24.1.1967 (NSW 85455); between Lakes Wellington, Victoria and Reeve, near Seacombe, T.B. Muir No. 2325, 13.10.1961 (MEL; NSW 85549).

Named in honour of Richard Helms, one time Assistant Entomologist to Department of Agriculture, N.S.W., and Naturalist to the Elder Expedition through Central Australia, who collected some excellent specimens of some of the *Poa* spp.

of the Australian Alps. He contributed two articles on the geography and natural history of the Australian Alps to the Journal of the Royal Geographical Society of Australasia, Vol. VI, Nos 4 and 5 (1896) 75–96, 101–110.

P. helmsii is generally readily recognisable by its coarse, rather light-green foliage and often rather compressed shoots and culms, and by its preference for noticeably wet sites along mountain streams or soakage areas. Occasionally, however, it may be difficult to distinguish it from the more luxuriant forms of *P. labillardieri* with flat expanded leaves.

23. P. poiformis (*Labill.*) *Druce* in Rep. Bot. Soc. Exch. Club for 1916, 2nd Suppl. (1917) 640; Black, Fl. S. Austral. ed. II (1943) 123; Gardner, Fl. W. Austral. I, Gram. (1952) 108; (all the preceding as *P. poaeformis**); Willis, Handb. Pl. Vict. (1962) 95, in part and excluding synonymy.

Basionym: *Arundo poaeformis* Labill., Nov. Holl. Pl. (1804) 27, t. 35.

Holotype: N. Holl., Labillardière (FI; duplicate at K), in herb. Webbianum. Plate XV.

Synonyms: *P. australis* R. Br., Prod. (1810) 179 quoad syn., excl. descr. et spec., nom. illeg.; based on *Arundo poaeformis* Labill. Willis, Handb. Fl. Vict. (1962) 96, uses the name *P. australis* in an aggregate sense and discusses the confusion in both the nomenclature and the recognition of populations in *Poa*. See also Black, l.c. and Gardner, l.c.

P. laevis R. Br., Prod. (1810) 179. Holotype: Western Australia: King Georges Sound, R. Brown No. 6289 (BM; duplicates at K and MEL; photograph at NSW). In the Prodromus Brown cites the collection as from D (i.e. Tasmania), but in his manuscripts and on the specimen the locality is given as King Georges Sound.

P. plebeia R. Br., Prod. (1810) 179. Holotype: Iter Austral. (given in Brown's manuscripts as Port Jackson), R. Brown No. 6288 (BM; duplicate at K; photograph at NSW).

P. urvillei Steud., Syn. Pl. Gram. (1854) 262. Holotype: Victoria: Port Western (i.e. Western Port), Urville (P).

P. australis var. *Billardieri* Hook. f., Fl. Tas. II (1~~9~~858) 123; based on *Arundo poaeformis* Labill.

Densely caespitose perennial chiefly inhabiting maritime and estuarine sandy foreshores and cliff-faces, erect, 20–90 cm. high, with extravaginal and sometimes intravaginal shoots, rarely with vertical or oblique rhizomes developed to meet changing soil levels. Sheaths usually smooth to the touch, sometimes scaberulous between the nerves, not or scarcely compressed, the upper close around the culms, the lower becoming rather loose and often somewhat shining, usually pallid at the base, very rarely purplish. Ligule truncate, 0·25–1·25 mm. long, densely minutely ciliolate at the apex and on the back. Blades more or less rigid, somewhat thick in texture (as compared with related Australian species), usually strongly convolute and terete or angular-terete, occasionally more or less expanded and up to 2 mm. broad in vivo with incurved margins, shortly folded at the acute point, mostly 0·25–1·5 mm. diameter, often almost as long as or even longer than the culms, sometimes more or less glaucous, the outer surface smooth (very rarely slightly scabrous), the inner surface scabrous. Culms simple, terete, slender to moderately stout, usually smooth, sometimes a little scabrid below the panicle. Panicle 8–30 cm. long and 1–6 cm. broad, commonly contracted and more or less linear, sometimes with spreading branches but then usually at least some of the branches (including the upper branches) short and with spikelets almost to their bases, often tardily emerging from the sheath. Rhachis more or less terete and smooth; branches angular, lightly to rather strongly scabrous, the lowest 2- to 7-nate, unequal, rarely the

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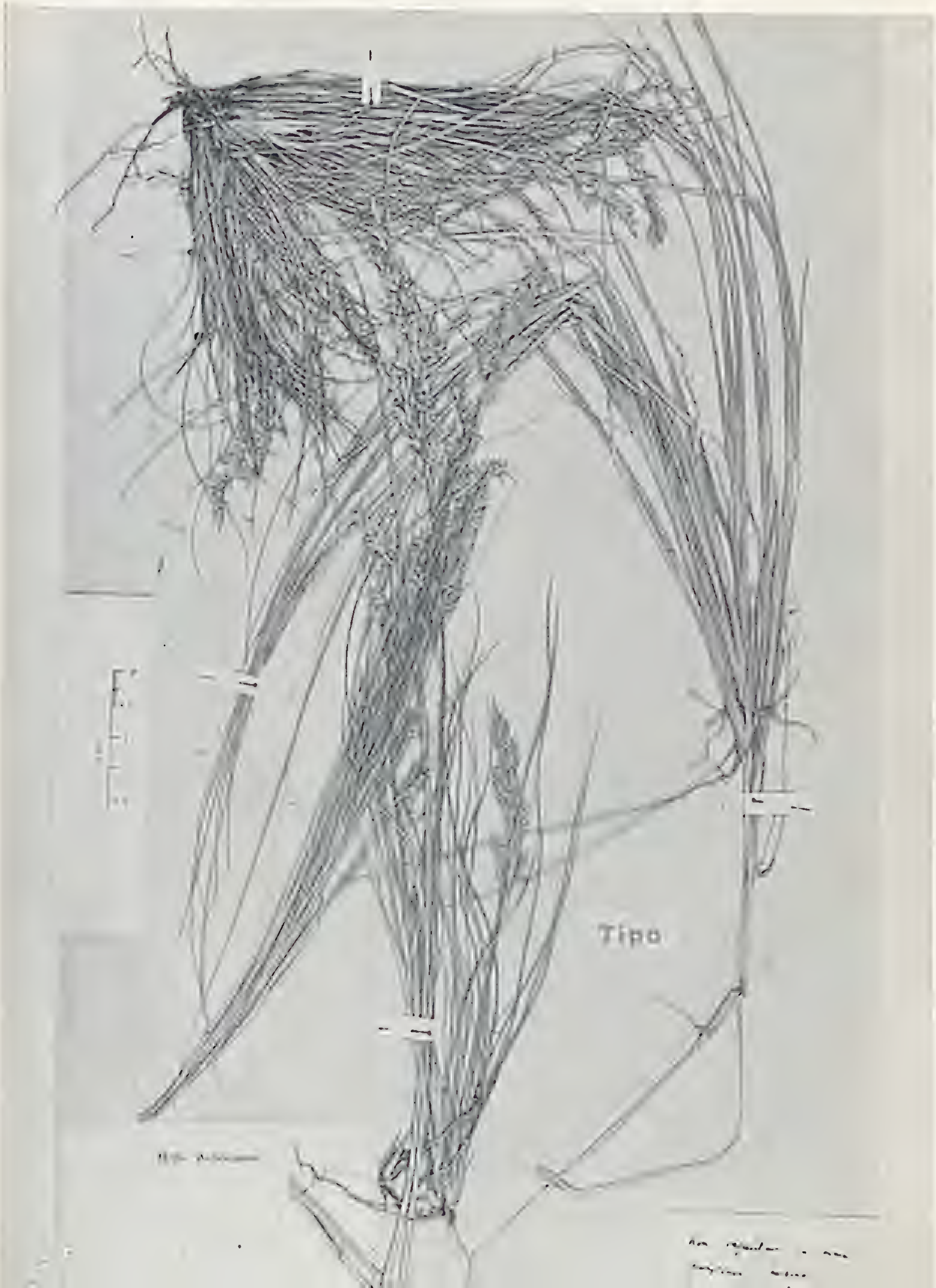
* Because of the unusually short stem of the epithet *Poa*, I would have preferred to retain the form "*poaeformis*" for the specific epithet, but the 1966 edition of the International Code of Botanical Nomenclature appears to make it mandatory to alter the connecting vowel from "ae" to "i".

Plate XV.



longest up to 14 cm. long; pedicels 0·5–7 mm. long, but generally many of them short, so that the spikelets are relatively crowded on the branches, rather stout and manifestly enlarged towards the apex, lightly to very densely scabrous or very rarely almost smooth. Spikelets pale-greenish or straw-coloured, 2– to 7– (usually 3– to 5–) flowered, compressed, lanceolate to ovate-lanceolate, 6–10 mm. long and, at anthesis, 5–7 mm. wide. Glumes firm, acute to acuminate, rather narrow to rather broad, distinctly 3–nerved or rarely the lower only 1–nerved, usually more or less scabrous on the keels and often on the sides upwards and minutely scabrid-pubescent on the upper margins, 3–5 mm. long, the lower two-thirds to seven-eighths as long as the lowest lemma, the upper equal or a little longer. Web usually long and copious, occasionally much reduced. Lemma 3–6 (usually 4–5) mm. long, keeled and compressed, lanceolate to linear-lanceolate when viewed from the side, subacute to obtuse or truncate, 5–nerved, very rarely 7–nerved, firm, the upper margins and apex narrowly membranous, usually long- or short-hairy on the keels up to about the middle and on the lateral nerves and margins at the base but rarely these hairs more or less reduced, the internerves usually glabrous but occasionally with some scattered hairs, usually more or less scabrous on the keel upwards and sometimes also on the back. Palea narrow, at length about as long as the lemma, sparsely to very densely scabrous to scabrous-ciliolate (usually the cilia in one row but occasionally more) on the keels above and smooth towards the base, glabrous to pubescent or scabrous on the back below. Lodicules free, membranous, unequally lobed. Anthers pale yellow, linear, 1·7–3 mm. long. Ovary turbinate. Grain about 1·8 mm. long, plump, keeled, oblong, usually free from the palea but sometimes (even on the same specimen) adnate to the palea. "Coast Tussock Grass" or "Blue Tussock Grass".

P. poiformis appears to be restricted to a narrow belt lining ocean foreshores and estuaries of the southern half of Australia, and on Lord Howe Island, occasionally ascending the heights of coastal sand-dunes and cliffs, but rarely beyond the influence of winds carrying ocean-spray or at least its salt content. On the New South Wales coast it is mostly to be found on or in the shelter of south-facing cliffs, probably because it is nearing the northerly limits of its extension into warmer zones.

Lord Howe Island: Flat ground, Eclipse Exped. 1871, comm. C. Moore No. 35 (K; MEL); sandy and other exposed places near the shore, also on the Admiralty Rocks, J. MacGillivray 9.1853, Voyage of HMS Herald, Bot. No. 705 (K); Fullager, herb. F. Mueller 1879 (K; MEL); abundant on coast on south end of Island, Milner No. 22, 9.1853 (K); Lind & Fullager (MEL); Admiralty Islets, C. Hedley & W.S. Dunn 9.1908 (NSW 9032; K); NE slope of Mt. Lidgbird, R.D. Hoogland No. 8810, 7.11.1963 (CANB; NSW 68271); Signal Point, R.D. Hoogland No. 8656, 28.10.1963 (CANB; NSW 68270); SE lower slopes of Malabar, P.S. Green No. 1567, 11.11.1963 (AAH; NSW 84476).

New South Wales: A. Cunningham (K); Morpeth, Leichhardt 10.1842 (NSW 39022); Newcastle, Leichhardt (NSW 39023); Stockton, J.B. Cleland 10.1915 (NSW 39026; AD); Sydney, Stephensons No. 108 (K); Sydney, Byrne (K); Coogee, on rocky escarpment, A.A. Hamilton 4.11.1916 (NSW 39030); Sydney Botanic Gardens, cult. from plants from Kurnell, W.F. Blakely 11.1914 (NSW 9031); Maroubra, on rocky escarpment, A.A. Hamilton 11.11.1916 (NSW 39025); Botany, H. Deane 10.1884 (NSW 39032); Botany Bay, A.A. Hamilton 18.11.1916 (NSW 39028); Sandringham, J.H. Camfield 21.10.1893 (NSW 9030; K); Garie Beach, National Park, common on banks fronting the ocean, J. Vickery 18.12.1956 (NSW 42319); Gundamaian, National Park, on shores of Port Hacking a few feet above sea-level on steep banks, J. Vickery 18.12.1956 (NSW 42320); National Park, W.F. Blakely 18.11.1936 (NSW 39029); Jervis Bay at "Hole in the Wall", F.A. Rodway 11.1920 (NSW 39013); Bowen Island, Jervis Bay, F.A. Rodway 11.1919 (NSW 39769); Jervis Bay, R.N. Makin 11.1913 (NSW 38996); Tabourie Island, 50 miles S of Nowra, F.A. Rodway 1.1.1940 (K; NSW 39011); N. Tollgate Island, Batemans Bay, F.A. Rodway 1.1924 (NSW 39009); Montague Island, F.A. Rodway 4.4.1932 (NSW 39010; K); Montague Island, off Narooma, J. Vickery 1.2.1935 (NSW 39020); Montague Island, A. Costin 11.1959 (NSW 51314–51320); cult. at Cooma from plant from Cuttagee, S of Bermagui, coll. J. Vickery 4.1959, M.E. Phillips 25.11.1959 (NSW 50290).

Victoria: Mallacoota, T.B. Muir No. 1847, 24.11.1960 (MEL; NSW 85368); Oberon Bay Beach, Wilsons Promontory, Audas & St. John 10.11.1908 (MEL); The Nobbies, Phillip Is., Westernport, common, basaltic dark-brown soil on headland, L.A.S. Johnson 2.4.1959 (NSW 49859); Ricketts Point, E.J. Sonnenburg 26.11.1931 (K); Portland, C. Walter 1.1888 (MEL); Bridgewater, A.C. Beauglehole No. 591, (NSW 82601); SW coast of Victoria, H.B. Williamson (NSW 9034; K); Port Campbell National Park, E.W. Finck & A.C. Beauglehole No. 21471, 29.10.1966 (NSW 101086); Port Fairy, W.T. Whan (NSW 38986); Port Fairy, in the dunes along the beach front in deep sand, D.E. Symon 8.11.1959 (ADW 21734); Marlo, coastal, in sand, M.E. Phillips No. 93, 16.11.1961 (CBG 003070; NSW 60868); Kent Group, Bass Strait, A.H. Mattingley 28.11.1937 (MEL; K); Kent's Islands, Bass Strait, R. Brown No. 6290 in part, 1803 (K), included by Brown under *P. australis*.

Tasmania: Archer (NSW 38988); Gunn No. 598 (NSW 38987); Hooker (labelled "*P. australis* Br. γ Fl. Tasm.") (K); Storey (K), (Bentham wrote on this sheet "grain furrowed, adnate to the palea". I found the grain to be free from the palea in the floret I examined); Isabella Island, Furneaux Group, Franklin Strait, the common grass of the island, among White-faced Storm-petrel Burrows, D.L. Serventy 10.1952 (K; MEL); Swan Island, Blandinet 1.1878 (NSW 38901); Cape Grim, Smithton, sea shore, D. Martin 12.1937 (NSW 9097; K); Boat Harbour, N of St. Helens, N.T. Burbidge 11.1.1949 (CANB 3098; HO; K); 6 miles S of St. Helens, M.E. Phillips No. 538, 30.1.1962 (CBG 3083; NSW 60867); Pipers Heads, T.E. Burns Nos. S/2, S/3, 17.12.1955 (NSW 38991, 38992); Swanport, Story (MEL); Spring Beach, M.E. Phillips No. 614, 1.2.1962 (CBG 003087; NSW 60866); sand-dunes at Marion Bay, Bream Creek, W.M. Curtis 1.1945 (K); Blythe River, C. Davis 3.1.1937 (K; NSW 42321); Domain, Hobart, F.A. Rodway 11.1898 (NSW 39005); Sandy Bay, Hobart, A.H.S. Lucas 11.1924 (NSW 38993); 7-Mile Beach near Hobart, J.E.S. Townrow 14.12.1966 (HO); The Neck, Bruny Is., M.E. Phillips No. 707, 5.2.1962 (CBG 003088; NSW 60865); 4 miles W of Strahan, on ocean beach, R. Carolin 14.1.1960 (SYD); Ocean Beach, near Strahan, J. Vickery 20.1.1949 (NSW 7498; HO); Ocean Beach, Strahan, M.E. Phillips No. 317, 23.1.1962 (CBG 003079; NSW 60869); Strahan, on coastal sand-dunes, green, densely tufted tussocks, ca. 40 cm. high, S.T. Blake No. 18373, 20.1.1949 (BRI; NSW 57160); Eaglehawk Neck, at Blowhole, J. Vickery 15.1.1949 (NSW 7497, 39007); North Breaksea Island, Port Davey, sea-level to 300 feet, M. Davis No. 1330, 13.3.1954 (MEL); New Harbour, C. Davis 1.1938 (NSW 39004); Eaglehawk Neck, bank near sea, S.T. Blake No. 18282, 15.1.1949 (BRI; NSW 57151); Southport, J. Vickery 20.1.1962 (NSW 60863, 60864; CBG 003082).

South Australia: Aldinga Bay, in sand, J.B. Cleland No. H38, 31.10.1928 (K; AD); Halletts Cove, J.B. Cleland No. H116, 9.10.1920 and No. H482, 24.9.1932 (K; AD; BRI); Marino Cliffs, near sea, J.B. Cleland No. H489, 8.10.1932 (K; AD; BRI); Brighton Cliffs, 9.10.1883 (AD); Grange, O.E. Menzel 9.1896 and 10.1896 (AD); Lake Alexandrina, F. Mueller 27.4.1878 (MEL); Venus Harbour, R.S. Rogers 9.1907 (NSW 39002); Campbell Park, Lake Albert, J.B. Cleland 16.10.1955 (AD; ADW 12948, 20984); Port Elliston, R.S. Rogers 9.1907 (NSW 38999); Pedlar's Creek, sand-hills, 5.11.1882 (AD); Tumby Bay, Eyre Peninsula, sand-dunes sea-front, D.E. Symon 15.11.1960 (ADW 23167); Hardwicke Bay, between Brentwood and Warooka, Yorke Peninsula, in the sand-dunes, D.E. Symon Nos. 1959A, 1959B, 1959C and 1959D, 1.3.1962 (ADW 24436–24439; NSW 57123–57126); dunes on the coast of Sturt Bay, E of Davenport, S coast of Yorke Peninsula, D.E. Symon Nos. 2028, 2029 and 2030, 2.3.1962 (ADW 24433–24435; NSW 57127–57129); Fishery Bay, 20 miles SW of Port Lincoln, Eyre Peninsula, in coastal sand-dunes, D.E. Symon 13.11.1960 (ADW 23163; NSW 57294); Ad Ripon, Eyre Peninsula, R.L. Crocker 8.1942 (ADW 5280); Proper Bay, Port Lincoln, J.B. Cleland 7.12.1941 (AD); Memory Cove, near Port Lincoln, J.H. Maiden 1.1907 (NSW 39000); Pearson Island, granite rubble channel, T.G.B. Osborn 6.1.1923 (NSW 38994); Granite Island, Victor Harbour, herb. J.M. Black 11.1926 (AD); Granite Island, Victor Harbour, E.H. Ising No. 2334, 6.10.1928 (K); Inman River Mouth, J.B. Cleland 2.1.1953 (AD); Waitpinga, J.B. Cleland 31.1.1953 (AD); Encounter Bay, J.B. Cleland No. H144, 1.1924 (K; AD) and 31.8.1924 (AD); Port Elliot, J.B. Cleland No. H149, 11.1921 (K; AD; NSW 38989); Port Elliot, J.E.L. Marshall 18.10.1930 (ADW 512); Eight-Mile Creek, South East, C.M. Eardley 4.2.1942 (ADW); Beachport, sand-hills, 12.11.1882 (AD); Robe, C.D. Black 10.1910 (AD); Macdonell Bay, J.B. Cleland 2.11.1941 and 30.11.1941 (AD); shores of Brown Lake, Mt. Gambier, D.E. Symon No. 1190, 6.3.1961 (ADW 23695); Cape Northumberland, herb. J.M. Black 14.1.1908 (AD); near Cape de Couédic, Kangaroo Island, J.B. Cleland No. 140 and No. H142, 17.11.1924 (K; AD; BRI); D'Estrèe Bay, Kangaroo Island (AD); Dudley Peninsula, Kangaroo Island 22.11.1883 (AD).

Western Australia: Geraldton, A. Lea (PERTH); Swan River, Preiss No. 1860 (LE; G; MEL), cited as *P. plebeia* by Bentham, l.c., and by Nees in Lehmann, Pl. Preiss.; Swan River, Preiss No. 1830 (G; GOET; MEL), cited by Nees, l.c. p. 275 as *P. laevis*; Preiss No. 1857 (G; P; S; W; MEL), cited by Nees, l.c., as *P. affinis*,; SW Australia, Drummond No. 449 (K; MEL), cited by Bentham, l.c., as *P. plebeia*; SW Coast, C.A. Gardner No. K271, 5.1913

(PERTH; K); Swan River, Drummond Nos. 168 and 168A (K); South West Bay, low places near the sea, Oldfield No. 864 (K; MEL); Cygnet Bay, Alan Cunningham 1882 (K); Rossiter Bay, E. McCarthy 21.10.1901 (K); Hamelin Bay, R.D. Royce No. 3940, 26.10.1952 (PERTH); Murchison River, Oldfield (MEL; K); Long Island, Recherche Archipelago, J.H. Willis 11.11.1950 (MEL); Hamelin Jetty near Cape Leeuwin, sand dunes, C.A. Gardner 12.1934 (PERTH; K); Cottesloe, herb. W.V. Fitzgerald 11.1900 (NSW 39018); Busselton, F. Stoward 1917 (NSW 39003); Cape Leeuwin, ½ miles N of lighthouse, B.G. Briggs 13.10.1960 (NSW 52375); Port Malcolm, Israelite Bay, C.A. Gardner No. 2903, 3.10.1931 (PERTH); Bremer Bay, J.W., herb. A. Morrison 1900 (K); Bremer Bay, J. Wellstead 1900 (PERTH; K); Bremer River, Webb 1884 (MEL); King Georges Sound, sand by the sea, Oldfield No. 673 (MEL; PERTH); King Georges Sound, R. Brown 1802–5 (MEL); King Georges Sound (MEL); King Georges Sound, J.H. Maiden 9.1909 (NSW 38990) and 11.1909 (NSW 9033; K); Albany, H.E. Sheath 11.1904 (MEL; NSW 39015); Torbay Inlet, H.E. Sheath 12.1902 (NSW 38998) and ex herb. W.V. Fitzgerald (NSW 38997); Esperance, F.J. Daw 10.1903 (NSW 39014).

Some specimens may be difficult to distinguish from *P. labillardieri* which is characteristic of fresh-water alluvia and the better watered slopes of hills, but in the field they can generally be distinguished readily enough even when in close proximity (as seen at Garie Beach, National Park, N.S.W.). Generally the more condensed, crowded inflorescence and smooth, slightly thicker leaves of *P. poiformis* serve to discriminate between them.

Bentham, Fl. Austral. VII (1878) 651, incorrectly synonymised *Arundo poaeformis* Labill. and *Poa australis* var. *billardieri* Hook. f. under *Poa billardieri*, which is an orthographic variant of *P. labillardieri* Steud. (q.v.), and described and cited specimens of *P. poiformis* thereunder.

P. poiformis (Labill.) Druce is the earliest legitimate name for any one of the complex of species of *Poa* which have for so long been loosely known to Australians as "*Poa caespitosa*" and, more recently, as "*Poa australis*". For any workers who may disagree completely with the present taxonomic treatment of the group and the concepts upon which it is based, this name would therefore presumably be the one to be adopted.

24. P. halmaturina *J.M. Black* in Trans. Roy. Soc. S. Austral. LXVI (1943) 248; Black, Fl. S. Austral., ed. 2, I (1943) 124.

HOLOTYPE: SOUTH AUSTRALIA: Rocky River, Kangaroo Island, "in burnt consolidated dunes, J.B. Cleland 3.12.1940, on Tate Society Expedition (AD)."

Small, rigid, glabrous perennial with dense tufts of extravaginal shoots and elongate slender rhizomes clothed with rather thin, long, pointed scales. Culms erect, 5–10 cm. long. Sheaths thin, smooth, the lower pale or purplish. Blades inrolled-terete, rigid, almost pungent, externally smooth except sometimes slightly scabrous near the apex, often curved, 2–8 cm. long, closely scabrous on the inner surface and on the margins, about 0·7 mm. diam. Ligule very short, firmly membranous, truncate, minutely ciliolate at the apex. Panicle 1·5–3 cm. long, contracted and sometimes almost spike-like with 1–3 short erect branches and few spikelets. Spikelets very shortly pedicellate, 2- to 4-flowered, 4–5 mm. long. Glumes about 3 mm. long, slightly unequal, 3-nerved. Web copious, consisting of long woolly hairs. Lemma ca. 3–3·5 mm. long, subacute, 5-nerved, hairy on the keel, lateral nerves and often on the internerves in the lower part of the back. Palea about as long as the lemma, pubescent on the back, scabrous on the keels sometimes grading to long-scabrous below.

SOUTH AUSTRALIA: KANGAROO ISLAND: Rocky River, J.B. Cleland 2.2.1940, 24.11.1945, 28.11.1954 (AD) and 12.1940 (MEL); Cape de Couedie, J.B. Cleland No. H145, 17.11.1924 (AD; K); Cape de Couédic, T.G.B. Osborn 29.11.1923 (AD); Kangaroo Island, A.J.K. Walker 1.1962 (ADW 24159; NSW 85462).

The manifest development of long scaly rhizomes and short stature of the plant differentiate this species from *P. poiformis* of which, at first acquaintance, I was inclined to think it was only a depauperate state. In a personal communication Sir John Cleland advised that the plants were growing in the hollows between high consolidated sand dunes perhaps a mile from the sea, the soil being very poor and much leached. The collector of ADW 24159 noted it as occurring on "deep sand dunes near Rocky River, forming a sparse open turf much cropped by native animals".

A specimen from Salt Creek, on the mainland in SE South Australia, collected by (and in the herbarium of) Lindley D. Williams, appears to be this species but no rhizomes are present. *P. halmaturina* should be sought in this locality.

25. P. exilis *Vickery*, sp. nov.

Gramen perenne caespitosum innovationibus intravaginalibus et foliis gracillimis. Culmi gracillimi, folia valde excedentes, 10–60 cm. alti, laeves vel tenuiter scabri, subteretes, striati, ca. 2–nodi. Vaginae laeves vel minute scabrae, arctae vel inferiores tandem aliquando laxae. Ligula firme membranacea, truncata, ca. 0·5 mm. longa. Laminae convolutae, angularo-teretes, tenuiter scabrae, gracillimae, ca. 0·3 mm. diametro, 5–15 (raro –30) cm. longae, virides vel obscuro-virides, tenuiter apiculatae, aliquanto molles, saepe plus minusve flexuosae, haud rigidae. Panicula delicatula, 1–10 (raro –15) cm. longa, laxe patens, ramis filiformibus, scabris, spiculas paucas in dimidio superiore ferentibus, ramis inferioribus 1–4–natis. Spiculae virides vel purpurascentes, 3–5–flores, parviusculae, compressae, pedicellis brevibus scabris. Glumae inaequales, 3–nervatae, acutae vel subacuminatae, 1·5–2 mm. longae, plerumque angustiusculae, sursum praesertim ad carinas leviter scabrae. Aranea plerumque absens. Lemma 5–nervatum, 2–3·5 mm. longum, lanceolatum vel anguste lanceolatum, obtusum, subglabrum vel basin versus ad carinam et nervos laterales minute et macilente pilosae, internervis glabris. Palea lemma subaequalans, ad carinas sursum minute scabra, deorsum laevis, ad dorsum minute scabra. Antherae ca. 1·25 mm. longae.

HOLOTYPE: NEW SOUTH WALES: Tantawanglo Mountain, on hill W of 6-Mile Creek, J. Vickery 7.1.1959 (NSW 50163).

Fine-leafed caespitose perennial with intravaginal innovations. Culms slender, much exceeding the leaves, 10–60 cm. high, smooth or finely scabrous, sub-terete, striate, about 2–noded. Sheaths smooth to minutely scabrous, tightly enclosing the culm or the lower becoming somewhat loose. Ligule firmly membranous, about 0·5 mm. long, truncate. Blades inrolled, angular-terete, finely scabrous, very fine, about 0·3 mm. diameter, mostly 5–15 cm. long (occasionally to 30 cm. in shady situations), green to greyish-green, finely pointed, rather soft (not rigid) and often more or less flexuose. Panicle delicate, 1–10 (rarely to 15) cm. long, loosely spreading, the lowest whorl of branches 1– to 4–nate, the branches filiform, scabrous, bare in the lower $\frac{1}{2}$–$\frac{2}{3}$, bearing few spikelets. Spikelets green or purplish, 3– to 5–flowered, rather small, shortly pedicellate, compressed, the pedicels scabrous. Glumes unequal, 3–nerved, acute to subacuminate, 1·5–2 mm. long, usually rather narrow, slightly scabrous upwards especially on the keel. Web usually absent. Lemma 5–nerved, 2–3·5 mm. long, lanceolate to narrowly lanceolate, obtuse, subglabrous or minutely and sparsely hairy on the keel and lateral nerves towards the base, quite glabrous on the internerves. Palea almost as long as the lemma, minutely scabrous on the keels in the upper two-thirds and smooth at the base, minutely scabrous on the back. Anthers about 1·25 mm. long.

New South Wales: Chiefly coastal and on the eastern slopes of the Tablelands. Braidwood district, W. Bäuerlen 12.1884 (MEL); lower slopes of Mt. Jellore, 2730 feet, 10 miles NW of Bowral, F.A. Rodway 3.11.1935 (NSW 39137; K; BRI); Currowan State Forest near Nelligen, R. Pullen No. 3965, 6.12.1963 (CANB; NSW 69386); Bodalla State Forest, Narooma district, in eucalypt forest, H.S. McKee No. 6904, 2.1.1960 (NSW 50166); Tilba, E. Breakwell 12.1913 (NSW 39129); Brockelo's Creek, on Bermagui to Tanja road, J. Vickery 6.1.1959 (NSW 50165); ca. 4 miles SW of Tanja on Bega road, J. Vickery 6.1.1959 (NSW 50164); cult. at Cooma, from plant collected ca. 1 mile S of Tanja, J. Vickery 4.1959, M.E. Phillips 25.11.1959 (NSW 50289); 6-Mile Creek, Tantawanglo Mountain, J. Vickery 7.1.1959 (NSW 50170); Cathcart, J. Vickery 14.1.1940 (NSW 9078; K); Maneroo (Monaro) Plains (BRI 000842); Brown Mountain, E of Nimmitabel, ca. 3200 feet, R. Pullen Nos. 4004, 4005, 30.1.1964 (CANB; NSW 69433, 69434); Bega, Lofts 3.12.1953 (NSW 50171); ca. 6 miles N of Tathra, J. Vickery 5.4.1958 (NSW 50167); Eden, Twofold Bay, E. Cheel 18.12.1903 (NSW 39130); Boydtown, Twofold Bay, G. Davis 27.12.1952 (NSW 50168).

Victoria: Cann River Valley, E Gippsland, W.S. Sayer 1887 (MEL; K); Genoa district, W. Bäuerlen 2.1885 (MEL).

South Australia: Rivoli Bay, F. Mueller (MEL); Millicent, J.B. Cleland 12.10.1949 (AD).

This species resembles a fine-leafed form of *P. sieberana*, from which it may be distinguished by the lemmas being completely glabrous on the internerves, the hairs if any being restricted to the keel and lateral nerves, and by the palea being scabrous on the keels without any development of cilia in the lower part. From the subalpine *P. clivicola*, to which it also has some resemblance, it is distinguished by the softer and less rigid leaves, and the smaller and narrower glumes and lemmas.

26. P. clivicola *Vickery*, sp. nov.

Gramen perenne, caespitosum, 15–60 cm. altum, viride vel glauco-viride, gracile, foliis tenuissimis, innovationibus intravaginalibus. Culmi gracillimi, teretes, plerumque laeves glabrique, 1–2–nodi, nodis glabris. Vaginae laeves vel minute scabridae, glabrae, basi pallidae. Ligula 0·5–1·5 mm. longa, firme membranacea, truncata, ad apicem ciliolato-laciniata, ad dorsum laevis vel minute scabra. Laminae convolutae, teretes vel angulare-teretes, tenuissimae, plerumque 3–15 cm. longae, 0·2–0·4 mm. diam., tenuiter apiculatae, leviter vel densiuscule scabrae, raro sublaeves, haud rigidae. Panicula 2–12 cm. longa, laxa, ramis inferioribus 2–5–natis, ramis capillaribus in dimidio inferiore, indivisis et sine spiculis, sursum parce divisis spiculas paucas ferentibus, pedicellisque leviter scabris. Spiculae valde compressae, purpurascentes vel viridescentes, 2–7–flores. Glumae inaequales, acutae, modeste latae vel aliquantum latae, 3–nervatae, ad carinas scabrae, aliquando sursum ad lateria leviter scabrae. Aranea 0 vel obsolescens. Lemma 3–4 mm. longum, lineare-lanceolatum vel lanceolatum, acutum vel subacutum, 5–nervatum, glabrum vel ad carinam deorsum et basi nervorum lateralium parcissime breve pilosum, saepe ad carinam et lateria sursum scabrum. Palea linearis, ad carinas sursum scabra vel minutissime scabra deorsum laevis, ad dorsum scabra vel scabro-pubescens vel subglabra. Antherae ca. 1·5–2·5 mm. longae, flavescentes vel purpurascentes.

Holotype: New South Wales: Kosciusko Plateau, junction of Wragge's and Piper's Creeks, J. Vickery and M.E. Phillips 9.1.1956 (NSW 46029).

Fine-leaved, slender, caespitose, green or glaucous-green perennial, 15–60 cm. high, the innovations intravaginal, Culms very slender, terete, usually smooth and glabrous, 1– to 2–noded, the nodes glabrous. Sheaths smooth to minutely scabrid, glabrous, pallid at the base. Ligule 0·5–1·5 mm. long, firmly membranous, truncate, ciliolate-laciniate at the apex, smooth or minutely scabrous on the back. Blades inrolled, terete or angular-terete, very fine, mostly 3–15 cm. long and 0·2–0·4 mm. diameter, finely pointed, lightly to rather closely scabrous, rarely almost smooth, usually not rigid. Panicle 2–12 cm. long, loose, the lower branches 2- to 5-nate, all the branches capillary, undivided and devoid of spikelets in their lower half, very sparingly divided and bearing rather few spikelets upwards, and together with the pedicels lightly scabrous. Spikelets strongly compressed, purplish or greenish, 2- to 7-flowered. Glumes unequal, acute, 3-nerved, moderately to rather broad, scabrous on the keels and sometimes slightly scabrous on the sides upwards. Web absent or obsolescent. Lemma 3–4 mm. long, linear-lanceolate or lanceolate in side view, acute or subacute, 5-nerved, glabrous or very sparingly and shortly hairy on the keel near the base and at the base of the lateral nerves, often scabrous on the keel above or throughout and often also on the sides upwards. Palea linear, from very minutely to moderately coarsely scabrous on the keels in the upper three-quarters and smooth below, scabrous or scabrous-pubescent or subglabrous on the back. Anthers 1·5–2·5 mm. long, yellow or purplish.

Occurs chiefly on the better drained grassland slopes of the Australian Alps between about 4,000 and 6,000 feet.

New South Wales: Beean Beean Creek, Barrington Tops, 5000 feet, L.A.S. Johnson 1.12.1954 (NSW 46018); near Mt. Franklin, in peat swamp, 5300 feet, S.T. Blake No. 13894, 19.1.1939 (BRI); 1 mile beyond Upper Cotter Ranger's Hut towards Yoauk Gap, M. Gray No. 4947, 14.12.1960 (CANB; NSW 57749); Mt. Gingera, near summit ca. 5900 feet, W side, *E. pauciflora* woodland, R. Pullen No. 4073, 27.1.1965 (CHR; NSW 93846); Snowy Flat, near Mt. Gingera, Bimberi Range, ca. 5350 feet, R. Pullen No. 2467 in part, 19.12.1960 (CANB; NSW 56438); Snowy Flat, Mt. Gingera, J. Vickery 25.1.1964 (NSW 67704); Bimberi Peak, Upper Cotter River, R.H. Cambage No. 3447, 15.1.1912 (NSW 46034); 8 miles and 9 miles NNE of Rules Point, ca. 4400 feet, well drained slope, subalpine grassland in treeless valley, B.G. Briggs 25.12.1960 (NSW 52858, 52859); Upper Gudgenby, 4300 feet, R.H. Cambage No. 3466, 16.1.1912 (NSW 46035; SYD); Snowy Mts., dry woodlands, 5000 feet, M. Mueller 2.1953 (NSW 46017); near Wilsons Valley hut, M.E. Phillips 2.12.1955 (NSW 46024); Teddy's Creek, M.E. Phillips & J. Raeder-Roitzsch 8.1.1957 (NSW 46030); Happy Jacks road, M.E. Phillips 20.12.1954 (NSW 46037); Happy Jacks Plain, Headwaters of Happy Jacks River, ca. 15 miles S of Kiandra, J. Vickery 18.1.1958 (NSW 46020, 46021); western edge of Happy Jacks Plain, J. Vickery 20.1.1958 (NSW 46015, 46019, 46022); Happy Jacks Plain near Tower 2, Grey Mare track, M.E. Phillips 22.12.1959 (NSW 48978); McKeahnie's Creek catchment, Happy Jacks Plain, M.E. Phillips 28.1.1965 (CBG); Kosciusko Plateau, Plains of Heaven track, J. Vickery & M.E. Phillips 9.1.1956 (NSW 46027, 46028); Mt. Kosciusko, J.B. Cleland, H. Deane & R.T. Baker 12.1910 (NSW 46025); Cooma, cult. from plant from Bett's Camp, M.E. Phillips & S. Smith-White 8.12.1955 (NSW 46026); Cooma, cult. from plant from Wragge's Creek, M.E. Phillips & S. Smith-White 8.12.1955 (NSW 46016); Mt. Lachlan River (? Maclaughlin R., S of Nimmitabel), Maiden 12.1896 (NSW 46036).

Victoria: Mt. Buffalo, ca. 5000 feet, grassland adjacent to The Lake, J. Vickery 13.1.1959 (NSW 47015); Native Dog Creek, Gippsland, Howett 1883 (MEL).

The spikelets are rather similar to those of *P. costiniana*, but the lemmas tend to be rather smaller and the leaves are finer and scabrous. From *P. nivicola* and *P. sieberana*, with which it commonly grows associated, it differs in the glabrous internerves of the lemma and in the keels of the palea being scabrous but not ciliolate.

27. P. costiniana *Vickery*, sp. nov.

Gramen perenne, dense caespitosum, 15–80 cm. altum, innovationibus intravaginalibus rarissime extravaginalibus, plerumque paludes alpinas vel subalpinas vel relictas vel rivulorum margines vel prata uvida habitans. Culmi teretes vel leviter compressi, laevi vel vix scabridi, graciliusculi, 1–2-nodi, nodis glabris. Vaginae inferiores pallidae rarissime purpurascentes, laeves vel parce retrorse scabro-pubescentes, superiores plerumque plus minusve laeves. Ligula ca. 1–3 mm. longa, firme membranacea, truncato-obtusa, ad apicem minute ciliolata, ad dorsum puberula. Laminae convoluto-teretes vel confertim plicatae compressaeque, 7–40 cm. longae, 0·3–1·75 mm. diam. vel latae, plerumque nitido-virides, saepe lucentes, omnino laeves vel aliquando paulo supra vaginas retrorse scabro-pubescentes, faciebus interioribus scabro-pubescentibus, ad apices carinatas plus minusve abrupte angustatae, rigidiusculae. Panicula 5–20 cm. longa, laxe contracta vel tandem late patens et plus minusve pyramidalis, ramis inferioribus 2–5-natis, ramis filiformibus in dimidio inferiore indivisis et sine spiculas, in dimidio superiore spiculas pauciusculas ferentibus, ramulis pedicellisque paulo vel manifeste scabris. Spiculae 2–5-flores, purpurascentes vel viridescentes vel raro flavidae, compressae vel paululum turgidae, ovatae. Glumae latiusculae, inaequales, acutae vel breve acuminatae, ad carinas plerumque validiuscule scabrae, ad nervos laterales lateraque laeves vel scabrae vel raro scabro-pubescentes, modeste langae, superior 3– (raro –5–) nervata, inferior 1– vel plerumque 3-nervata. Aranea modeste copiosa vel exigua vel obsoleta. Lemma 3·5–5·5 (plerumque 4·5) mm. longum, modeste latum, deorsum ad carinam dense vel exigue pilosum sursum scabrum, basi nervorum marginalium parce pilosum, ad internervos plerumque glabrum vel parce pubescens vel scabrum, saepe sursum ad nervos et plerumque internervos minute scabrum, firmiusculum, acutum vel subacutum, ad apicem et anguste ad margines membranaceum, submanifeste 5-nervatum. Palea ad carinas sursum plerumque scabra vel scabro-ciliolata deorsum laevis, ad dorsum scabra vel pubescens vel glabra laevisque, firmiuscula, anguste lanceolata vel lineare-elliptica. Antherae 2–2·6 mm. longae, purpurascentes vel flavescentes. Caryopsis oblongum, compressum, carinatum, contra sulcatum, ca. 2·5 mm. longum.

HOLOTYPE: NEW SOUTH WALES: Mt. Kosciusko, 5000–7000 feet, R. Helms, 2.1893 NSW 45793).

Erect, densely caespitose perennial, 15–80 cm. high, with intravaginal innovations (rarely with an extravaginal shoot), characteristically found in alpine or subalpine bogs or relict bogs or bordering streams or in very wet alpine grassland and extending up into grassland especially at the higher altitudes where it is usually more stunted in growth. Culms terete or lightly compressed, smooth or very lightly scabrid, moderately slender, 1- to 2-noded, the nodes glabrous. Lower sheaths pallid or very rarely purplish, smooth or sparsely retrorsely scabrous-pubescent, the upper sheaths usually more or less smooth. Ligule about 1–3 mm. long, firmly membranous, truncate-obtuse, minutely ciliolate at the apex and puberulous on the back. Blades convolute and terete or closely folded and compressed, 7–40 cm. long, 0·3–1·75 mm. in diameter or across, usually bright-green, often shining in vivo, entirely smooth or sometimes retrorsely scabrous-pubescent for a short distance above the sheath and completely smooth above, finely scabrous-pubescent on the inner (upper) surface, more or less abruptly narrowed into the pointed keeled tip, rather rigid. Panicle 5–20 cm. long, loosely contracted or at length much spreading and more or less pyramidal, the lower branches 2- to 5-nate, the branches filiform, unbranched and devoid of spikelets in their lower half and bearing rather few spikelets in the upper half, the branches and pedicels lightly to prominently scabrous. Spikelets 2- to 5-flowered, purplish or greenish or rarely yellowish, compressed but slightly plump, ovate. Glumes broad or rather broad, unequal, acute to shortly acuminate, usually rather strongly scabrous to long-scabrous on the keels and smooth to scabrous or rarely scabrous-pubescent on the lateral nerves and sides, moderately long, the upper glume 3- (rarely 5-) nerved, the lower 1- to (usually) 3-nerved. Web from moderately well developed to rather scanty, obsolescent or absent. Lemma 3·5–5·5 (usually 4·5) mm. long, moderately broad, closely or thinly hairy on the keel in the lower half or two-thirds and scabrous above and slightly hairy at the base of the marginal nerves, usually glabrous on the internerves, or occasionally glabrous throughout, often minutely scabrous on the nerves and sometimes upwards on the internerves, rather firm, acute to subacute, membranous at the apex and narrowly along the margins, rather distinctly 5–nerved. Palea scabrous to rather long-scabrous or scabrous-ciliolate on the keels in the upper three-quarters, smooth below, glabrous and smooth (more rarely scabrous or pubescent) on the back, rather firm, narrowly lanceolate or linear-elliptical. Anthers 2–2·6 mm. long, purplish or yellowish. Grain free from the palea, oblong, keeled and compressed, grooved on the ventral side, ca. 2·5 mm. long. Occasionally displays "vivipary". Possibly one of the species known as "Horny Grass" in Victoria. Plate IX, 4.

Australian Alps, chiefly in wet situations, a form extending to the New England Tableland in New South Wales.

NEW SOUTH WALES: Mt. Gingera, J. Vickery 25.1.1964 (NSW 67691, 67699); 8 miles NNE of Rules Point, ca. 4400 feet, a large tussock forming an "island" in running water 6 inches deep, B.G. Briggs 25.12.1960 (NSW 52856); N of Mt. Tate, in alpine herbfields near Granite Peaks, ca. 6500 feet, A.B. Costin 26.2.1958 (CANB); Cabramurra, snow-ridge area, M.E. Phillips 2.2.1956 (NSW 45818); Happy Jacks Plain, headwaters of Happy Jacks River, in *Eucalyptus pauciflora* forest, ca. 4900 feet, J. Vickery 17.1.1958 (NSW 45795); western edge of Happy Jacks Plain, ca. 15 miles S of Kiandra, J. Vickery 20.1.1958 (NSW 45791, 45796–45799); ridge above Happy Jacks Creek, ca. 12 miles S of Kiandra, large tussocks at creek, J. Vickery 20.1.1958 (NSW 45800); Happy Jacks Plain, in *Sphagnum* bog, J. Vickery 17.1.1958 (NSW 45801); Barney's Creek, part headwaters of Happy Jacks River, ca. 16 miles S of Kiandra, J. Vickery 21.1.1958 (NSW 45794, 45803); Toolong Range near Round Mountain, W of the divide on Tooma Dam site road, ca. 18 miles SW of Kiandra, J. Vickery 20.1.1958 (NSW 45802); Upper Tooma River headwater, S. James 2.1954 (NSW 45815); Big Jagungal at 6600 feet on rocky slopes, M. Mueller 23.2.1953 (NSW 45831); Cooma, cult. from plant from Brook's Hut, Happy Jacks Plain, M.E. Phillips 25.11.1959 (NSW 50292); Cooma, cult. from plant from Happy Jacks River, M.E. Phillips 25.11.1959 (NSW 48979); Munyang, 5385 feet, M. Mueller 28.2.1953 (NSW 45830); Club Lake Creek catchment, near Carruthers Peak, W.G. Bryant No. 2, 7.3.1967 (NSW 98002); Kosciusko Plateau, in middle swamp on Plains of Heaven track, J. Vickery & M.E. Phillips 9.1.1956 (NSW 45811, 45812, 45823); Kosciusko Plateau, swamp nearest Daner's Gap on Plains of Heaven track, J. Vickery & M.E. Phillips 9.1.1956 (NSW 45805); Kosciusko Plateau, Daner's Gap, J. Vickery & M.E. Phillips 6.1.1956 (NSW 45822); Kosciusko Plateau, between Wragge's and Piper's Creeks, J. Vickery & M.E. Phillips 9.1.1956 (NSW 45792); junction of Wragge's and Piper's Creeks, J. Vickery & M.E. Phillips 9.1.1956 (NSW 45804, 46007, 46008); Wilson's Valley, swampy site, M.E. Phillips 2.12.1955 (NSW 45806, 45817); Kosciusko Plateau, near Charlotte Pass towards Snowy River, J. Vickery & M.E. Phillips 8.1.1956 (NSW 45814); Kosciusko Plateau, near Charlotte Pass on Blue Lake track, J. Vickery & M.E. Phillips 8.1.1956 (NSW 45999); head of Spencer's Creek, Kosciusko, 5900 feet, L.A.S. Johnson & E.F. Constable 19.1.1951 (NSW 15973); Spencer's Creek, below Sugarloaf, M.E. Phillips 20.1.1956 (NSW 45819); Mt. Kosciusko, tree-line to 7000 feet, J.H. Maiden & W. Forsyth 1.1899 (NSW 45809); Mt. Kosciusko, 5000–7000 feet, R. Helms 2.1893 (NSW 45998; K); top of Mt. Kosciusko, Kerry 11.1897 (NSW 45821); Mt. Kosciusko, A.B. Costin 3.1949 (NSW 45828); Mt. Kosciusko, C. Skottsberg 10.3.1949 (NSW 45829); Kosciusko, J. Vickery 4.2.1930 (NSW 45832) and 14.1.1940 (NSW 9057; K); Mt. Kosciusko, summit, 7300 feet, L.A.S. Johnson & E.F. Constable 20.1.1951 (NSW 15747); Mt. Kosciusko, 200 feet below summit, H.S. McKee No. 6960, 5.1.1960 (NSW 49922); Bett's Camp, Kosciusko Plateau, J. Vickery & M.E. Phillips 6.1.1956 (NSW 45808); Bett's Camp, Mt. Kosciusko, J. McLuckie 1924 (SYD); Bett's Camp, Kosciusko Plateau, M.E. Phillips, M. Dettman & R. Izon 19.1.1955 (NSW 45827); Kosciusko Plateau, Blue Lake track, 5900 feet, M. Mueller 4.2.1955 (NSW 45826); Blue Lake track near Mt. Kosciusko, 6000 feet, M. Mueller 4.2.1955 (NSW 46012); Wilkinson's Valley track, M.E. Phillips 1.4.1957 (NSW 46011); Kosciusko Plateau, Cootapatamba Creek below North Ram's Head, J. Vickery & M.E. Phillips 7.1.1956 (NSW 45824); Dead Horse Gap, swampy ground, J. Vickery 8.1.1959 (NSW 46895), and in grassland (NSW 47003).

VICTORIA: Bogong High Plains, Towonga Huts, A.C. Beauglehole No. 22491 in part, 25.1.1967 (NSW 85453); Bogong High Plains, 1 mile NE of Scout Hut, J.S. Turner 1.1948 (MEL 52; K), and track N of Scout Hut (MEL; K); near Mt. Hotham, J. Vickery 11.1.1959 (NSW 46890); Bidwell, Upper Delegate River, subalpine, wet soil, N.A. Wakefield No. 4822, 19.1.1953 (NAW); Diggers Holes, Nunniong Plateau, over 4000 feet, N.A. Wakefield No. 2645, 5.1.1949 (NAW); Bentley's Plain, Nunniong Plateau, 4000 feet, in moist grassy flat, N.A. Wakefield No. 4829, 26.1.1953 (NAW).

P. costiniana is particularly characteristic of alpine bogs and the margins of streams, where it may grow up through masses of *Sphagnum* moss and associated herbage. It extends up into wetter parts of the subalpine grassland in association with such species as *P. hiemata*, *P. sieberana*, *P. phillipsiana* and *P. fawcettiae*. At the highest elevations (e.g. at and near the summit of Mt. Kosciusko at 7,000 feet and over) it extends up the hillsides and ridges where it forms a thick turf of closely appressed, rather short and rigid-leafed tussocks.

It can usually be distinguished from all four of the species mentioned in the preceding paragraph by its lemma being glabrous on the internerves or sometimes even entirely glabrous, from the latter three by its shining green leaves, and from *P. phillipsiana* and *P. fawcettiae* further by its usually pallid lower sheaths. On moist alpine meadow slopes *P. costiniana* and *P. hiemata* often form a dense mixed turf in which it may at times be difficult to discriminate between the two species in the field; however, the leaves of *P. costiniana* are generally coarser and more rigid, while the panicles and spikelets are generally coarser and heavier-looking than those of *P. hiemata*. Although curious as a botanical test it is perhaps none the less worth recording that upon a pure stand of *P. hiemata* the collector will find a soft and enjoyable resting place, while upon a pure stand of *P. costiniana* it will prove more prickly and uncomfortable.

Named in honour of A.B. Costin whose ecological studies have so greatly augmented knowledge of the vegetation of the Snowy Mountains area.

I am admitting the following specimens from the New England district of New South Wales, somewhat reluctantly, as *P. costiniana*. Geographically this northern population is isolated from that of the Australian Alps, but it has been collected in the cooler parts of the New England and frequently in comparatively moist sites. In this region the extensive peaty swamps of the Alps do not occur. However, just as the population in the Australian Alps can persist under marginal conditions in better drained pastures, the northern population appears to have persisted, somewhat tenuously, in the less unsuitable sites in the north. Often, but not invariably the northern population exhibits rather more slender leaves, with a tendency to greater angularity in cross section, but an occasional specimen from the Australian Alps can be found to exhibit a similar extreme. In short I have failed to find any constant morphological character which would on the one hand serve to characterize all the specimens of the northern population and on the other hand distinguish it from the southern.

NEW SOUTH WALES: Between Glen Innes and Dundee, ca. 3750 feet, in grassland with light tree growth, J. Vickery 22.1.1961 (NSW 85543); Stonehenge, J.H. Maiden 2.1899 (NSW 85540); Ben Lomond, 15 miles N of Guyra. 4500 feet, E.N. McKie No. 606, 14.11.1930 (K; BRI); Crystal Brook, Guyra, 4300 feet, E.N. McKie No. 735, 10.12.1932 (K); Rosehill, 5½ miles S of Guyra, E.N. McKie No. 610, 1.12.1930 (K; BRI) and No. 610A, 10.11.1930 (K; BRI in part); 5½ miles S of Guyra, shady situation, R. Roe 13.12.1948 (CANB AR615) an unusually fine-leafed plant; Oban road, E.N. McKie 26.12.1947 (NSW 85541); ca. 11 miles SW of Ebor on Wollombi road, in swampy area, J. Vickery 10.1.1958 (NSW 85533); Biscuit Creek, ca. 7½ miles NW of Ebor on Guyra road, in swampy grassland, J. Vickery 10.1.1958 (NSW 85546); ca. 6 miles NW of Ebor on Guyra road, in rather dry swampy area, J. Vickery 10.1.1958 (NSW 85539); ca. 4 miles NW of Ebor on Guyra road, small fine-leafed tussocks in low forest, J. Vickery 10.1.1958 (NSW 85534); Ebor Falls, J. Vickery 10.1.1958 (NSW 85536, 85542); ca. 16 miles S of Walcha on Nowendoc road, J. Vickery 8.1.1958 (NSW 85538); Walcha, L.J. Durham 25.11.1952 (NSW 85537); 14 miles S of Walcha on Nowendoc road, J. Vickery 8.1.1958 (NSW 85545); 7 miles NW of Yarrowitch on Oxley Highway, in swampy area, J. Vickery 12.1.1958 (NSW 85535).

28. P. gunnii *Vickery*, sp. nov.

Gramen perenne caespitosum glabrum 6–40 cm. altum innovationibus intravaginalibus raro extravaginalibus. Culmi graciles, teretes, laeves vel leviter scabri, aliquando sub paniculam scabri, plerumque 1– raro 2–nodi, nodis glabris. Vaginae laeves vel parce et minute scabridae, inferiores pallidae haud purpurascentes. Ligula membranacea, usque ad 1·5 mm. longa, truncata, ad apicem lateresque minute ciliolata, ad dorsum parce et minute scabra vel pubescens. Laminae convolutae, quam vaginas angustiores, 5–25 cm. longae, 0·3–0·75 mm. diam., ad apices breves carinatas apiculatas brevissime angustatae, ad superficies sublaeves vel minute scabrae, ad partes interiores scabrae. Panicula parva, 3–8 cm. longa, laxa vel laxe contracta ramis breviusculis filiformibus, inferioribus 1–5–natis, inaequalibus, in dimidio inferiore indivisis et sine spiculis, ramis pedicellisque scabris. Glumae latae vel latissimae, breves vel longiusculae, acutae vel subacutae vel raro obtusae, 3–nervatae vel inferior 1–3–nervatae, aliquanto inaequales, ad carinas scabrae et ad nervos laterales lateresque saepe leviter scabrae. Aranea macilenta vel 0. Lemma 3–4·5 mm. longum, latiusculum, leviter 5–nervatum, oblongum, obtusum vel subacutum, in toto glabrum et laeve vel in dimidio inferiore ad carinam et aliquando ad prope bases nervorum lateralium brevissime parce pilosum, firmum sed marginibus apiceque membranaceis, aliquando sublucens et plus minusve tenuiter induratum. Palea firma, ad carinas tenuiter densiuscule minute scabra, ad dorsum scabropubescens vel scabra vel glabra. Antherae 2 mm. longae, flavescens vel purpurascens.

HOLOTYPE: TASMANIA: Summit of Mt. Wellington, R. Gunn No. 1466, 7.1.1841 (K; duplicate NSW 45698).

SYNONYMS: *Poa australis* var. *monticola* Hook. f., Fl. Tas. II (1858) 123 (LECTOTYPE: TASMANIA: Summit of Mt. Wellington, R. Gunn. No. 1466, 7.1.1841 (K; duplicate NSW 45698). *Poa caespitosa* var. *alpina* F.Muell. ex Benth., Fl. Austral. VII (1878) 652 (LECTOTYPE: TASMANIA: Arthur's Lakes, R. Gunn No. 1466, 17.1.1845 (K)). Since both of these varietal epithets are pre-occupied in specific rank another must necessarily be provided.

Glabrous caespitose perennial, 6–40 cm. high, with intravaginal, rarely extravaginal, innovations. Culms slender, terete, smooth to lightly scabrid, occasionally scabrous below the panicle, usually 1– rarely 2–noded, the nodes glabrous. Sheaths smooth or very sparsely and minutely scabrid, the lower pallid not purplish. Ligule membranous, up to 1·5 mm. long, truncate, minutely ciliolate at the apex and sides, minutely and sparsely scabrous or pubescent on the back. Blades inrolled, narrower than the sheaths, 5–25 cm. long, 0·3–0·75 mm. diam., very shortly narrowed into the keeled pointed tip, subsmooth to minutely scabrous on the outer surface, scabrous on the inner surface. Panicle small, 3–8 cm. long, loose or loosely contracted with rather short filiform branches, the lower whorl 1– to 5–nate, the branches unequal, unbranched and devoid of spikelets in the lower half, the branches and pedicels scabrous. Spikelets broadly ovate, 2– to 5–flowered, compressed, purplish, greenish or somewhat golden, rarely yellowish. Glumes broad to very broad, short to moderately long, acute to subacute or rarely obtuse, 3–nerved or the lower 1– to 3–nerved, somewhat unequal, scabrous on the keels and often slightly so on the lateral nerves and/or sides. Web scanty or absent. Lemma 3–4·5 mm. long, rather broad, lightly 5–nerved, oblong, obtuse or subacute, completely glabrous or very shortly and sparsely hairy on the keel in the lower half and sometimes also at the base of the lateral nerves and otherwise glabrous and smooth, sometimes subshining and more or less thinly indurated, very rarely with a very sparse pubescence on the back, firm with membranous margins and apex. Palea firm, rather finely and closely to minutely scabrous on the keels in the upper three-quarters (the scabridities sometimes a little finer and softer towards the middle), scabrous-pubescent or scabrous or glabrous on the back. Anthers 2 mm. long, yellow or purplish. Occasionally "viviparous".

TASMANIA: Urville (P); Archer (NSW 45645, 45675; NSW 9054; K); Hannaford (NSW 45646); Mt. Barrow, E of Launceston, ca. 4500 feet, R. & R. Belcher No. 1345, 6.2.1968 (NSW 85525); St. Valentine's Peak, above rainforest belt, subalpine, M.E. Phillips No. 447, 26.1.1962 (CBG 003072; NSW 57021); Cradle Mountain, F.A. Rodway 12.1915 (NSW 45647); Waldheim Chalet, Cradle Mt., alpine moor, N.T. Burbidge No. 3515, 1.2.1949 (CANB; K), No. 3516, 1.2.1949 (CANB; K); Cradle Mt. Reserve, horse track at Marigold Creek, ca. 4000 feet, W.M. Curtis 7.3.1949 (HO; K), partially "viviparous"; near Duck R., on road to Cradle Mt., in alpine pasture, N.T. Burbidge No. 3511, 31.1.1949 (CANB; K; HO); Western Mountains, Gunn No. 1466, 20.12.1843 (NSW 45700, 45701; K); Mathinna Plains, ca. 2500 feet, M.E. Phillips 29.1.1962 (CBG 003061, 003062; NSW 56994, 56995); Shannon River at Great Lake, N.T. Burbidge No. 3434, 28.1.1949 (CANB; K; HO); Great Lake, 20 miles from Bronte Park, 3400 feet, M.E. Phillips No. 387A, 24.1.1962 (CBG 003071; NSW 57020); King William Saddle, 2720 feet, M.E. Phillips No. 360, 24.1.1962 (CBG 003105; NSW 63674); Mt. Rufus, upper exposed slopes above tree-line, N.T. Burbidge No. 3351, 25.1.1949 (CANB; K; HO); near Breona, Great Lake, about 3700 feet, M. Tindale 16.12.1954 (NSW 45643); Mt. Field National Park, Wombat Moor, ca. 3500 feet, W.M. Curtis 12.1944 (HO; K) and 9.1.1948 (K); Mt. Field National Park, Mt. Mawson, ca. 4000 feet, C. Elliott 27.4.1947 (K); Mt. Field National Park, ca. 4000 feet, J. Vickery 16.1.1949 (NSW 45697); Lake Dobson, Mt. Field East, J. Vickery 17.1.1962 (NSW 56984); Lake Dobson, ca. 900 m., more or less swampy ground, green, dense, small, erect tufts with purple spikelets, S.T. Blake No. 18314, 16.1.1949 (BRI; NSW 57133); Glen Leith, Gunn 28.12.1840 (NSW 46031); Mt. Wellington, Gunn No. 1466, 1.3.1839 (K); Mt. Wellington, near summit, 4160 feet, F.A. Rodway 12.4.1931 (NSW 45641); Mt. Wellington, summit, J. Vickery 13.1.1949 (NSW 45642); Mt. Wellington, summit, 4166 feet, F.A. Rodway 1.1899 (NSW 45648); The Pinnacle, Mt. Wellington, G. & C. Davis 30.1.1937 (NSW 45649; K); Mt. Wellington, J.H. Maiden & R.H. Cambage 1.1902 (NSW 9055; K); Mt. Wellington, C.T. White No. 8338, 2.2.1932 (BRI; K); Mt. Wellington, Bailey & Shirley 1.1892 (BRI; K); summit of Mt. Wellington, tufted grass between stones, N.T. Burbidge No. 3196, 19.1.1949 (CANB; K; HO); Mt. Wellington, at the pinnacle, W.M. Curtis 1.2.1947 (K); Mt. Wellington, track to Collinsvale, ca. 3500 feet, W.M. Curtis 7.2.1947 (HO; K); Mt. Wellington, J. Bufton 1896 (MEL; K); summit of Mt. Wellington, 4000 feet, W.M. Curtis 19.1.1945 (HO; K); near summit of Mt. Wellington, A. Simson No. 1148, 27.3.1878 (MEL); Mt. Wellington, T. Gullivar No. 11 (MEL), this bears in F. Mueller's handwriting the name "*Poa australia* Br. var. *alpina*"; summit of Mt. Wellington, Oldfield No. 107 (K); Mt. Wellington, summit, 4100 feet, D. Martin 30.1.1938 (NSW 45699); Mt. Wellington, summit near lookout, M. Tindale 13.12.1954 (NSW 45703); Mt. Wellington, J. Vickery 16.1.1962 (NSW 56973–56983); Mt. Wellington, summit, M.E. Phillips No. 62211, 16.1.1962 (CBG 003063) and No. 50 (CBG 003093); top of Mt. Wellington, 1250 m., among boulders and low spreading shrubs, low, dense, broad, more or less dull-green tufts, more or less oblique culms to 10 cm., S.T. Blake No. 18263 (BRI; NSW 57132); Mt. Wellington, ca. 4100 feet, common in fell fields, P.J. Darbyshire No. 1063, 3.1.1963 (CANB; NSW 63646); cult. at Penshurst, N.S.W., from root from summit of Mt. Wellington, E. Cheel 3.12.1910 (NSW 45644); Blackman's Bay, wet sandy heath, W.M. Curtis 12.1943 (HO; K 74); between Margate and Snug Plains, in open forest, J. Vickery 21.1.1962 (NSW 57031; CBG 003056); W of Margate, J. Vickery 21.1.1962 (NSW 57033); Huon Highway, ca. 10 miles S of Mt. Wellington, J. Vickery 19.1.1962 (NSW 57032); Mt. Nelson, W.M. Curtis 29.1.1947 (HO; K); Hartz Mountains, J. Vickery 19.1.1962 (NSW 56985–56993; CBG 003070); beside Lake Hartz and on Hartz Ridge, moorland, J.E.S. Townrow (HO), strongly "viviparous"; summit of Mt. La Perouse (MEL); summit of Mt. La Perouse, C. Stuart 1.3.1846 (MEL).

Poa gunnii is morphologically very similar to *P. costiniana* but the Tasmanian population has leaves that are as frequently lightly scabrous as smooth, and lemmas that are generally shorter and less narrowly drawn out. It is with some hesitation that I have treated *P. gunnii* as a distinct species and it is difficult to enunciate characters whereby all members of the respective populations can be distinguished. The alternative course of treating both Tasmanian and mainland populations as a single species would result in enlarging the concept of *P. costiniana* to a degree that would then introduce difficulties in distinguishing it (on key characters) from certain other species of the genus here recognised. The two populations appear to maintain only such slight morphological differences as might be expected from isolation. The situation illustrates the continuing problem of taxonomic treatment of populations whose biology is still so little understood and the treatment offered can be regarded only as a preliminary basis for further studies.

P. gunnii is found most abundantly at subalpine elevations, chiefly above 2,500 feet, in Tasmania, more rarely in wet heathy sites at lower altitudes, but it is less restricted to very wet habitats than is *P. costiniana*.

29. P. phillipsiana *Vickery*, sp. nov.

Gramen perenne, dense caespitosum, plerumque caeruleo-virides, innovationibus intravaginalibus, caespitibus foliosis, 15–25 cm. altis, culmis folia valde excedentibus usque ad ca. 80 cm. longis. Culmi 1–2–nodi, plus minusve teretes, laeves vel scaberuli vel plus minusve scabri, saepe sub paniculam scabrissimi, saepe leviter purpurascentes, modeste graciles, pedunculis plerumque valde exsertis. Nodi glabri vel minute scaberuli. Vaginae praesertim inferiores saepe purpurascentes, scaberulae vel tenuiter et laxe vel arcte scabrae, aliquanto leviter furfurosae secretione cerea. Ligula firma, brevissima vel usque ad 0·75 mm. longa, truncata, ad apicem minute ciliolata, ad dorsum scabra. Laminae plerumque firme involutae, plus minusve teretes vel aliquando dextere plicatae compressaeque, in vivo caeruleo-virides, rigidae, plerumque plus minusve erectae, subulatae, 7–25 (raro –45) cm. longae, 0·5–0·75 (raro –1·25) mm. diam., leviter vel densissime scabrae, raro laeves, aliquando plus minusve leviter furfurosae secretione cerea. Panicula 6–20 cm. longa, laxiuscule patens, ramis inferioribus 2–5–natis, inaequalibus, usque ad 10 cm. longis, sursum spiculas paucis ferentibus, ramis ramulis pedicellis scabris. Spiculae 3–5–flores, saepe purpurascentes. Glumae modeste latae vel latissimae, breviusculae, acutae, 3–nervatae vel inferior 1–3–nervata, ad carinas scabrae et ad nervos laterales aliquando leviter scabrae, ad lateres saepe tenuiter scabrae. Aranea macilenta vel raro obsolescens. Lemma 2·5–3·25 (rarely 3·5) mm. longum, latiusculum, obtusum, in dimidio inferiore ad dorsum plerumque dense pubescente, ad carinam nervos laterales marginesque pilis paulo longioribus, oblongo-lanceolatum. Palea elliptica, firma, ad carinas sursum scabra deorsum ciliolata, ad dorsum dense pubescens. Antherae ca. 1·5–2 mm. longae, flavescentes vel purpurascentes. Caryopsis late ellipticum, ad dorsum carinatum contra canaliculatum.

Holotype: New South Wales: Ridge above Happy Jacks township, beside creek, ca. 11 miles S of Kiandra, J. Vickery 20.1.1958 (NSW 44381).

Densely caespitose, generally bluish-green perennial with intravaginal innovations, the leafy tussocks commonly reaching to about 15–25 cm. and the culms much exceeding the leaves and up to about 80 cm. Culms 1– to 2–noded, more or less terete, smooth or scaberulous or more or less scabrous, often lightly purplish-tinted, moderately slender, often very scabrous below the panicle, the peduncle usually much exserted. Nodes glabrous or minutely scaberulous. Sheaths, especially the lower, often purplish-tinted, scaberulous or finely and loosely to closely scabrous, sometimes scurfy with a light waxy secretion. Ligule firm, extremely short or up to 0·75 mm. long, truncate, minutely ciliolate at the apex, scabrous on the back. Blades mostly firmly inrolled and more or less terete or occasionally closely folded and compressed, bluish-green when fresh, rigid and commonly more or less erect, subulate, 7–25 cm. long (rarely to 45 cm. if growing amongst thick tall undergrowth), ca. 0·5–0·75 (rarely 1·25) mm. diameter, lightly to very densely scabrous or rarely smooth, sometimes more or less scurfy with a light waxy secretion. Panicle 6–20 cm. long, rather loosely spreading, the lower branches 2– to 5–nate, unequal, the longest up to 10 cm., with rather few spikelets borne towards the ends of the branches and branchlets, the branches and pedicels scabrous. Spikelets 3– to 5–flowered, often purplish. Glumes moderately to distinctly broad, rather short, acute, 3–nerved or the lower 1– to 3–nerved, scabrous on the keels and sometimes slightly scabrous on the lateral nerves, often finely scabrous on the sides upwarbs. Web scanty, very rarely almost obsolete. Lemma 2·5–3·25 (rarely –3·5) mm. long, rather broad, obtuse, usually closely pubescent on the back in the lower half with slightly longer hairs on the keel, lateral nerves and margins, oblong-lanceolate. Palea elliptical, firm, scabrous on the keels above and ciliolate below, densely

pubescent on the back. Anthers ca. 1·5–2 mm. long, yellow or purplish. Grain broadly elliptical, keeled on the back, deeply furrowed in front.

Found chiefly on the upper and drier parts of hillsides in high montane to subalpine areas in New South Wales and Victoria, mostly between about 4,000 and 5,000 feet.

New South Wales: Federal Capital Territory, C.W.E. Moore No. 2364, 17.2.1953 (NSW 44405); Mt. Franklin, rocky ground under "snow grass", N.T. Burbidge No. 2799, 23.3.1948 (CANB); near Mt. Franklin, ca. 5000 feet, in *E. pauciflora* forest, S.T. Blake No. 13885, 19.1.1939 (BRI; NSW 64687); Mt. Franklin Chalet, D.E. Symon & M.V. Carter 16.1.1952 (ADW 19040 in part); slopes of Mt. Franklin, D.E. Symon 16.1.1952 (ADW 19041); Piccadilly Circus near Mt. Franklin, J. Vickery 24.1.1964 (NSW 67706); between Bulls Head and Mt. Franklin, Brindabella Range, ca. 4400 feet, eucalypt woodland, R. Pullen No. 2463, 19.12.1960 (CANB; NSW 56544); between Mt. Franklin and Mt. Gingera, J. Vickery 25.1.1964 (NSW 67696); Mt. Gingera, C.W.E. Moore No. 2371, 17.2.1953 (NSW 64686); Gingera, M.E. Phillips 2.2.1961 (CBG 003051; NSW 53499); Mt. Gingera, J. Vickery 25.1.1964 (NSW 67692, 67698); Snowy Flat, near Mt. Gingera, ca. 5350 feet, open space in *Eucalyptus pauciflora* woodland, R. Pullen No. 2467 in part, 19.12.1960 (CANB); top ridge of Mt. Gingera, Bimberi Range, ca. 6000 feet, R. Pullen No. 2546, 10.1.1961 (CANB; NSW 56541) and No. 3837, 27.2.1963 (CANB; NSW 63657); lower slopes of Mt. Bimberi, ca. 4600 feet, P. Darbyshire No. 112, 17.1.1961 (CANB; NSW 64720); ca. 1½ miles S of Kiandra, on hillside, J. Vickery 20.1.1958 (NSW 44388); near Kiandra, in Ash forest with *E. pauciflora*, M.E. Phillips 31.1.1956 (NSW 44406); ca. 5 miles SE of Kiandra, J. Vickery 20.1.1958 (NSW 44385); Sawyers Hill, ca. 2 miles S of Kiandra, at crest beside road, J. Vickery 20.1.1958 (NSW 44384); between Sawyers Hill and Rocky Plain Creek, ca. 5 miles SE of Kiandra, J. Vickery 20.1.1958 (NSW 44387); 8 miles NNE of Rules Point, ca. 4400 feet, moist ground near creek bank, B.G. Briggs 25.12.1960 (NSW 52857); between Cabramurra and Kings Cross, M.E. Phillips 2.2.1956 (NSW 44396, 44397); Snowy Mountains Highway, just past Cabramurra turnoff towards Rules Point, M.E. Phillips 8.2.1956 (NSW 44395); Cabramurra, snow ridge area, M.E. Phillips 2.2.1956 (NSW 44400); cult. at Cooma from plant from Cabramurra plateau, M.E. Phillips 25.11.1959 (NSW 64683); Tumut Pond Dam site, ca. 10 miles SW of Kiandra, J. Vickery 20.1.1958 (NSW 44115); Barneys Creek, part headwaters of Happy Jacks River, ca. 16 miles S of Kiandra, J. Vickery 21.1.1958 (NSW 44386); ridge above Happy Jacks township, ca. 12 miles S of Kiandra, J. Vickery 20.1.1958 (NSW 44383); Happy Jacks Plain, in *Eucalyptus pauciflora* forest amongst dense undergrowth, J. Vickery 17.1.1958 (NSW 44391); Happy Jacks Plain, headwaters of Happy Jacks River, ca. 15 miles S of Kiandra, in "snow-gum" forest on hillside, J. Vickery 17.1.1958 (NSW 44390); Happy Jacks road, M.E. Phillips 15.2.1956 (NSW 44394); Happy Jacks Plain, S of Brooks Hut, M.E. Phillips 19.12.1954 (NSW 44401); Happy Jacks Plain, around granite boulders and adjacent open grasslands of hillside in treeless "plain", J. Vickery 18.1.1958 (NSW 44389); McKeahnie's Creek catchment, Happy Jacks Plain, dry grassland, M.E. Phillips 28.1.1965 (CBG; NSW 82087); cult. at Cooma from plant obtained from Happy Jacks road, M.E. Phillips 5.12.1957 (NSW 44404); transmission line near Mt. Vale, Happy Jacks, I. Staff 25.1.1957 (NSW 44398, 44408); Kosciusko Plateau, west slope above Trapyard Creek in *Eucalyptus niphophila* woodland, M.E. Phillips 25.1.1957 (NSW 44409, 44410); Snowy Valley Road, near Munyang, M.E. Phillips & S. Smith-White 20.1.1955 (NSW 44403); Stock Whip Hill, between Jacobs River and Tin Mine, M.E. Phillips & J. Raeder-Roitzsch 10.1.1957 (NSW 44407); Kosciusko Road, below Sugarloaf, M.E. Phillips 20.1.1956 (NSW 45590); Kosciusko Plateau at Pipers Gap, J. Vickery & M.E. Phillips 8.1.1956 (NSW 45591); Ramshead Range, Snowy Mtns. region, ca. 5100 feet, E. Reiner No. 516, 28.12.1960 (CANB); Alpine Highway, west side of Dead Horse Gap, M.E. Phillips 25.1.1956 (NSW 44393); Pilot Lookout, W of Dead Horse Gap, J. Vickery 8.1.1959 (NSW 46833).

Victoria: Mt. Seldom Seen, ca. 5000 feet, R. & R. Belcher No. 1266, 8.1.1968 (NSW 85523); Mt. Buffalo, ca. 5000 feet, subalpine grassland of hillside above swamps, J. Vickery 13.1.1959 (NSW 46831, 47013); Johnson's Hut, Bogong High Plains, ca. 5700 feet, J.S. Turner 4.1948 (MEL); Bogong High Plains, W of Wallace's Hut, 5600 feet, T.B. Muir No. 673, 19.1.1959 (MEL; NSW 85381); near headwaters of Nightingale Creek, 3 miles SW of Mt. Wellington, T.B. Muir No. 3119, 3.1.1964 (MEL; NSW 85387).

This species forms extensive populations on some parts of the Southern Tablelands of New South Wales, growing in association with other species of "Snow Grass", especially *P. sieberana*. It can generally be recognised in the field by its more rigid, usually very scabrous, bluish leaves and frequently purplish lower leaf-sheaths.

Named in honour of Dr M.E. Phillips, whose collections, field studies in the Snowy Mountains area and cultural experiments at Cooma have contributed greatly to the present taxonomic study.

30. P. hookeri *Vickery*, sp. nov.

Gramen perenne parvum usque ad 50 cm. altum, foliis breviusculis mollibus subflaccidis capillaribus, innovationibus intravaginalibus. Culmi gracillimi, laeves vel laxe scabro-hispidi vel scabri, 1–2–nodi. Nodi glabri. Vaginae scabrae vel laxe vel densiuscule scabro-hispidae vel scabro-pubescentes, inferiores tenues plus minusve hyalinae pallidae vel fulvae. Ligula membranacea, 1–4·5 mm. longa, acuta vel longe acuminata, ad dorsum laevis vel puberula. Laminae 3–15 cm. longae, convolutae, capillares, molles, paulo delicatulae, laxe hispidae pilis brevibus vel breve scabrae. Panicula 3–10 cm. longa, laxe contracta vel tandem patens, ramis capillaribus, inferioribus 1–4–natis, in dimidio inferiore sine ramulis spiculisque, sursum spiculis paucis ferentibus, ramis ramulis pedicellis tenuiter scabris vel subscabro-hispidis. Spiculae parviusculae, 4–5–flores, viridescentes vel aliquantum purpurascentes. Glumae aliquantum tenues, acutae, laeves vel ad carinas distante longo-scabrae, ad lateres plerumque laeves, inferior 1–3–nervata, superior 3–nervata aliquando latior. Aranea 0. Lemma 2–2·5 mm. longum, oblongo-lanceolatum, obtusum, ad carinam nervos laterales internervosque leviter et minute pubescens vel pilis obsolescentibus. Palea ad carinas sursum minute scabra, deorsum laevis vel obscure ciliolata, ad dorsum leviter pubescens vel glabra. Antherae ca. 1 mm. longae.

HOLOTYPE: TASMANIA: M B, Kenmore, Gunn No. 1469, 19.11.1842 (NSW 9051; duplicate at K).

Small caespitose perennial with rather short, soft, subflaccid, capillary leaves and intravaginal innovations, up to 50 cm. high. Culms very slender, smooth to loosely scabrous-hispid or scabrous, 1- to 2-noded. Nodes glabrous. Sheaths scabrous to loosely or rather closely scabrous-hispid or scabrous-pubescent, the lower thin and more or less hyaline, pallid or brownish. Ligule membranous, 1–4·5 mm. long, acute to long-acuminate, smooth or puberulous on the back. Blades 3–15 cm. long, inrolled, capillary, soft and rather delicate, loosely hispid with short hairs or shortly scabrous only. Panicle 3–10 cm. long, loosely contracted or at length spreading, with capillary branches, the lower 1- to 4-nate, unbranched and devoid of spikelets in the lower half and bearing few spikelets in the upper half, the branches and pedicels finely scabrous to almost scabrous-hispid. Spikelets rather small, 4- to 5-flowered, greenish or somewhat purplish. Glumes rather thin, acute, smooth, or distantly rather long-scabrous on the keels above, mostly smooth on the sides, the lower 1- to 3-nerved, the upper 3-nerved and somewhat broader. Web absent. Lemma 2–2·5 mm. long, oblong-lanceolate, obtuse, lightly and minutely pubescent on the lateral nerves, keel and internerves in the lower part or the hairs obsolescent. Palea minutely scabrous on the keels above, smooth or obscurely ciliolate below, thinly pubescent to glabrous on the back. Anthers about 1 mm. long.

TASMANIA: Archer (NSW 39131); M B New Norfolk, Gunn No. 1469, 3.11.1840 (NSW 9050; K); New Norfolk, 11.1840 (K); Macquarie Plains, Gunn No. 1469, 19.11.1842 (K), (this specimen cited by Hooker f., Fl. Tas. II (1858) 124, as *P. australis* var. *capillifolia*. Two of the other three specimens cited are *P. rodwayi*); Hobart, J.D. Hooker (K); Formosa, Gunn No. 1470, 29.10.1841 (K), (this specimen also cited under *P. australis* var. *capillifolia* by Hooker. l.c.); Gordon River, F.A. Rodway 11.1898 (NSW 39135).

This rather imperfectly known species is similar to *P. rodwayi* and *P. sieberana*, but differs from both in its long acuminate ligule, from *P. rodwayi* in its less hairy leaves, and from *P. sieberana* in its usually softer and usually scabrous-hirsute leaves. Whether the long ligule is in fact an adequate mark of a distinctive population must await future investigation. A specimen from New South Wales, Boboyan Road, S of Gundenby at the Naas Creek crossing, ca. 3,600 feet, R. Pullen No. 2574, 25.1.1961 (CANB; NSW 56539) similarly displays a long acuminate ligule, yet seems otherwise to conform with *P. sieberana* and to belong to the *P. sieberana* population characteristic of that area.

For typification of *P. australis* var. *capillifolia* Hook. f., see under *P. rodwayi*.

31. P. sieberana *Spreng.*, Syst. Veg. Cur. Post. (1827) 35; Kunth, Enum. Pl. I (1833) 357; Nees in Flora XI, Part 1 (1828) 299; (all as **P. sieberiana*).

TYPE: Sieber No. 77 (probably collected in New South Wales). Duplicates at BM; K; MEL; MO. See Plate XVI.

SYNONYMS: *P. australis* R. Br. var. *sieberiana* (Spreng.) Hook. f., Fl. Tas. II (1858) 123, based indirectly, through citation of Kunth, on *P. sieberana* Spreng.; *P. implexa* Trin., Opuscula Agrostologica III, Miscellanea 388 (Mém. Acad. Sc. Petersb. sér. 6, I (1830) 388), based on Sieber No. 77 (TYPE NUMBER at K; MEL; MO); *P. caespitosa* Forst. var. *australis* Benth., Fl. Austral. VII (1878) 653 (LECTOTYPE: Port Jackson, R. Brown No. 6290, 1802–5, BM; K), see discussion below.

The combination *P. caespitosa* var. *australis* Benth. is nominally based on *P. australis* R. Br. *P. australis* R. Br. is illegitimate nomenclaturally since its circumscription included *Arundo poaeformis* Labill. and Brown should therefore have adopted the epithet "*poaeformis*" Brown also cited J. D. (i.e. Port Jackson and Tasmania) in his description, localities represented by specimens in his collections from Port Jackson and Kents Islands (in Bass Straits) respectively. These two collections are not conspecific. The protologue of *P. australis* therefore consisted of three elements.

Bentham could legitimately adopt the epithet "*australis*" in varietal rank, and its use in a legitimate combination dates from the Flora Australiensis (1878). Its typification is therefore necessary. It is clear that Bentham excluded *Arundo poaeformis* from his concept of the var. *australis*, since he cited it under another species, his "*P. billardieri*" (= *P. poiformis*). Under his var. *australis*, Bentham included in his citation: Nees in Sieb. Agrost. n. 77; *P. sieberiana* Spreng.; and *P. implexa* Trin., all of which are referrable to *P. sieberana* Spreng. Robert Brown's collection from Port Jackson agrees with *P. sieberana* Spreng., and conforms with his description of *P. australis* more closely than does the specimen from Kent's Islands, especially in regard to the phrase, regarded by me as of considerable diagnostic significance, "perianthii valvula exteriori basi lanata". I therefore designate Brown's collection from Port Jackson, (No. 6290 in part at BM; duplicate at K) as the LECTOTYPE of *P. caespitosa* var. *australis* Benth. The combination is therefore treated as a synonym of *P. sieberana* Spreng. in the present revision.

It is clear from Bentham's discussion that he had a number of forms and specimens under consideration when he drew up his description of the var. *australis*, but, in the absence of clearly cited specimens, these cannot affect the above considerations.

For further commentary regarding the confusion in use of the name "*P. australis*" see J.H. Willis, Handb. Pl. Vict. I (1962) 96, sub *P. australis*, sp. agg.

Densely caespitose, fine-leafed, greyish-green or sometimes bluish-green or glaucous perennial with intravaginal innovations (more rarely with occasional extravaginal innovations and then mostly in western plants and in the var. *hirtella*), 15–80 cm. high (or rarely to 100 cm. in shady forest), the rootstock very contracted or obliquely or vertically elongate and often branching at the lower nodes. Culms usually much exceeding the leaves, slender, more or less terete, variously smooth to scabrous. Sheaths scabrous or smooth, the lower usually pallid, very rarely purplish. Ligule short, 0·1–1 mm. long, truncate, firm, minutely ciliolate at the apex and scabrous on the back. Blades inrolled-terete or angular-terete, fine to very fine, 5–60 cm. long (commonly 10–25 cm. in open or dry forest or pasture but often much longer in shady moist forest) and 0·2–0·7 (usually 0·3–0·4) mm. diameter, from more or less straight or curved (especially when young) to very flexuose and interwoven (especially when old or dry), finely pointed, lightly to strongly scabrous or rarely almost smooth, occasionally remotely hirsute (in var. *hirtella*), the inner surface usually densely scabrous-pubescent. Panicle 3–20 cm. long, at first contracted, at maturity pyramidal with widely spreading branches, the branches slender to capillary, unbranched and devoid of spikelets in the lower half, rather sparingly branched with rather few spikelets in the upper part, the lower "whorl" 1– to 5–nate, the branches and pedicels lightly to closely scabrous. Spikelets compressed, often purplish or greenish, rarely yellowish, 2– to 7–flowered, more or less ovate. Glumes commonly rather short and broad, acute to subacuminate, more or less unequal, the lower 1– to 3–nerved, the upper 3–nerved, both lightly to distinctly scabrous on the keel and variously smooth or more or less scabrous on the sides, usually firm, sometimes minutely ciliolate on the margins near the base. Web rather scanty or obsolescent or frequently absent. Lemma usually rather short and (proportionately) broad, rather obtuse to subacute, oblong or lanceolate in side view, 1·8–3 (more rarely –4) mm. long, usually more or less closely and loosely pubescent or appressed-pubescent all over the lower part of the back with or without somewhat denser and slightly longer hairs on the keel, lateral nerves and margins, more rarely the hairs sparse or obsolescent or absent on some or most of the lemmas, firm, 5–nerved. Palea oblong to broadly oblong or elliptical, finely scabrous on the keels in the upper part and very finely ciliolate below the middle or rarely the cilia almost obsolete, pubescent or scabrous-pubescent on the back. Anthers 1–2 mm. long, yellowish or purplish. Grain oblong, keeled on the back, deeply grooved in front, ca. 1·5 mm. long. "Fine-leafed Tussock Grass" or "Snow Grass". Fig. 2.

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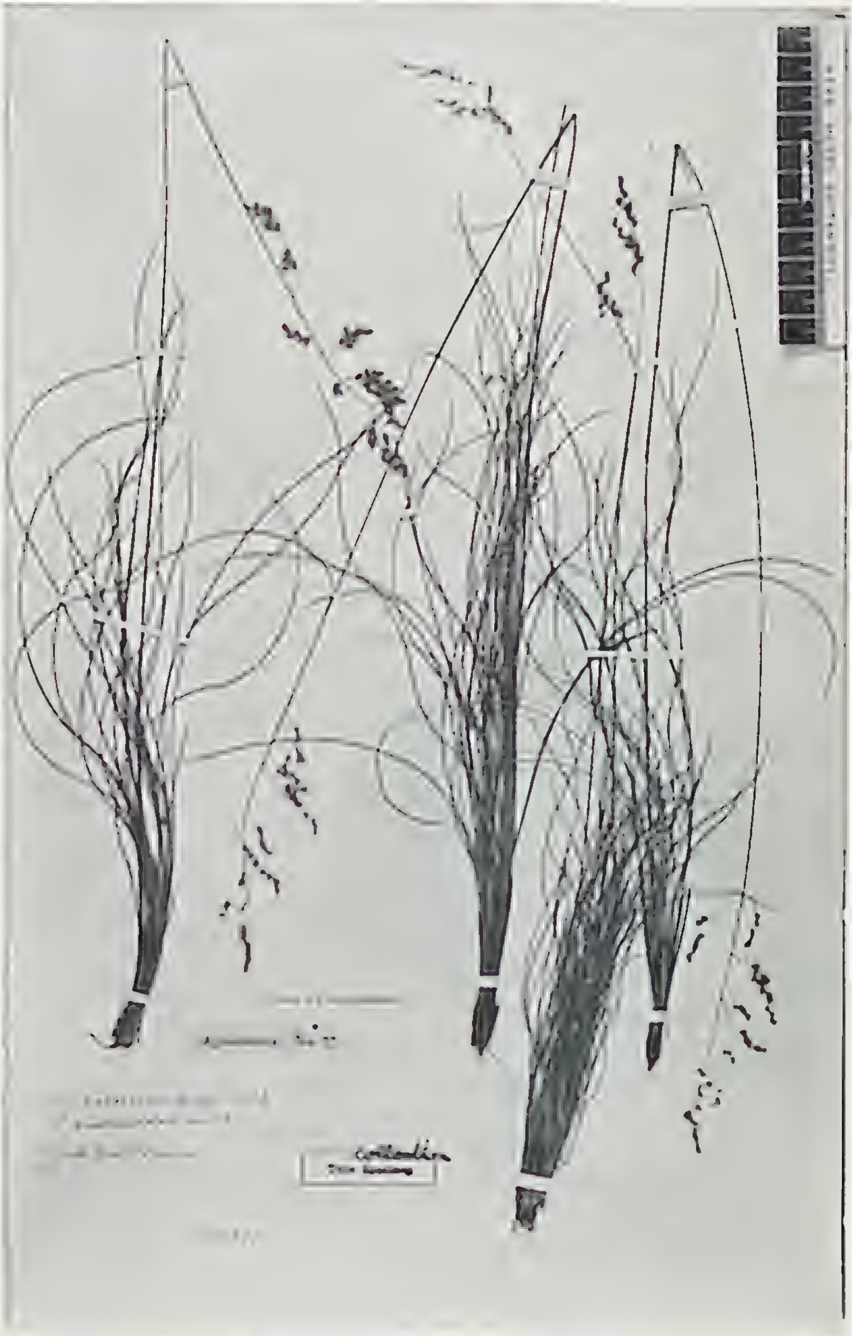
* The orthographically correct spelling is "*sieberana*", but the variant "*sieberiana*" has been used by previous authors.

A variable grass of wide distribution in eastern Australia and broad ecological tolerances, extending from little above sea level to over 5,000 feet altitude, from forest to open grassland, from poor sandy soils to relatively rich soils and from dry hillsides to sub-swampy sites. *P. sieberana* and *P. labillardieri* are the two most common species in New South Wales, the former generally in the drier or more stony sites, the latter preferring the moister alluvia.

Foliage-colour variants are not uncommon; on the Coast and Tablelands greyish-green is the prevailing colour, but somewhat bluish-green or glaucous variants occur either as local communities or isolated plants. At high altitudes the prevailing colour is green during the growing season and the tussocks may grow so closely as to merge into a dense sward in the high montane and subalpine meadows. In the latter districts the leaves are sometimes rather less strongly scabrous and there may be some degree of intergradation with the species described hereunder as *P. hiemata*. Occasional smooth-leafed forms may also occur at lower altitudes. With high density of tussocks, the lower internodes between the fascicles of intravaginal innovations become more elongate and rooting at the nodes only poorly developed; this results in the shoots being attached to the lower rooting system only by fine and easily fractured elongate stems ("vertical rhizomes"), a feature which renders the plant unduly susceptible to mechanical damage by trampling or other causes. When the subalpine sward is opened up by fire, grazing, etc., the typical tussock form of growth becomes at once apparent. The field appearance of the subalpine community suggests that it might be taxonomically distinct from the Tableland and coastal populations, but repeated examinations have failed to find any discontinuity of morphological features which could justify the separation or

Plate XVI.



Type Number (Sieber, Agrostotheca No. 77) of *Poa sieberana* Spreng. (BM).

serve to distinguish the populations, nor is there any geographic isolation. A degree of variation in the coarseness or fineness of the leaves often appears to be associated with conditions of the micro-habitat.

Two new varieties of *P. sieberana* are recognised below, which have appeared to me to have some claim to taxonomic status. Nomenclaturally this results automatically in the creation of a type variety, as var. *sieberana*. It must be clearly stated that as here conceived, and as represented by the specimens cited thereunder, this variety includes a wide range of variation which has so far defeated attempts to subdivide further. It includes, but is not necessarily restricted to, the precise form represented by the Type Specimen.

1. Characters other than as defined under 1* and 1** .... var. *sieberana.*

1.* Leaves capillary, often bluish in vivo. Plant rather small, sometimes somewhat stoloniferous with fascicles of intravaginal, occasionally extravaginal shoots .... var. *cyanophylla.*

1.** Leaves distantly hirsute with some of the scabridities elongated into rather stiff fine hairs. Plant caespitose but extravaginal shoots often present ...... var. *hirtella.*

var. sieberana. Plate X, 1; Plate XI, 1–2; Plate XVI.

Widely distributed in the south-eastern quadrant of the mainland of Australia and occasional in Tasmania.

QUEENSLAND: Warwick, Beckler (K); Darling Downs district, Ramsay, Marquis (BRI; K); Dress Circle, McPherson Range, on rock slopes, ca. 3300 feet, S.T. Blake No. 15377, 12.12.1943 (BRI).

NEW SOUTH WALES: 16 miles W of Tenterfield, R. Roe No. AR649, 14.12.1948 (CANB; NSW 57738); Clouds Creek, South Grafton, K.A. Kirby 12.1949 (NSW 46127); 25 miles NW of Guyra on road to Tingha, R. Roe No. AR629, 13.12.1948 (CANB); ca. 11 miles and ca. 8 miles NW of Ebor on Guyra road, J. Vickery 9.1.1958 (NSW 46110, 46108); ca. 7 miles NW of Ebor on Guyra road, J. Vickery 10.1.1958 (NSW 46101); Biscuit Creek, ca. 7½ miles NW of Ebor on Guyra road, J. Vickery 10.1.1958 (NSW 46102, 46104); ca. 4 miles NW of Ebor on Guyra road, J. Vickery 10.1.1958 (NSW 46107); Ebor Falls, J. Vickery 10.1.1958 (NSW 46094); top of Snowy Range, ca. 5 miles SW of Ebor on Armidale road, J. Vickery 10.1.1958 (NSW 46113); ca. 2 miles N of Point Lookout, New England National Park, J. Vickery 10.1.1958, in shade in rainforest area, large tussocks with long leaves (NSW 46111) and large tussocks with long fine leaves in shade of forest near creek (NSW 46092); Point Lookout, ca. 9 miles S of Ebor, 5250 feet, J. Vickery 10.1.1958 (NSW 46093, 46112); Point Lookout, New England National Park, C.K. Ingram 22.12.1958 (NSW 46793); ca. 42 miles W of Kempsey on Armidale road, J. Vickery 11.1.1958 (NSW 46096); 7 miles E of Bellbrook on Kempsey road, J. Vickery 11.1.1958 (NSW 46095); between Georges Creek and Jeogla on Kempsey to Armidale road, near top of ascent from creek, J. Vickery 10.1.1958 (NSW 46109); 11 miles, 12 miles and 14 miles W of Yarras on Oxley Highway, J. Vickery 11.1.1958 (NSW 46097, 46098, 46099); 10 miles SE of Yarrowitch on Oxley Highway, J. Vickery 12.1.1958 (NSW 46100); Walcha, L.S. Smith 11.1943 (BRI); Hastings River, Beckler 1877, (K, herb. F. Mueller); ca. 14 miles N of Nowendoc on Walcha road, J. Vickery 8.1.1958 (NSW 46103); ca. 7 miles and ca. 9 miles SE of Nowendoc on Wingham road, J. Vickery 7.1.1958 (NSW 46114, 46088); Gloucester Buckets, R. Coveny 1.1.1967 (NSW 85499); Tomaila Tableland, 4500 feet, R.W. Earp 30.1.1956 (NSW 46117); Barrington Tops, ca. 40 miles N of Singleton, R. Pullen No. 3789, 3.2.1963 (CANB; NSW 63654); Nine-mile Spur, above head of Kholwa River, Barrington Tops, ca. 4900 feet, common in *Eucalyptus nitens—E. pauciflora* communities above *Nothofagus moorei* forest, L.A.S. Johnson 1.12.1954 (NSW 46106); Bogan Gate, McGillivray 5.1.1925 (ADW 7724); Bowan Park, W.F. Blakely 11.1907 (NSW 9047; K); Orange, J.B. Cleland 11.1914 (AD); Neville district, R.C. Madsen 12.12.1950 (NSW 39098, 39099, 39100); Tuggerah, J.B. Cleland 10.1914 (AD); Hartley, E. Cheel ca. 1900 (NSW 9049; K); Blue Mountains, E. Betche 12.1882 (NSW 9072, 39107; K); Mt. Wilson, J. Gregson 12.1897 (NSW 39093); near Mt. York, smallish tussocks, leaves bluish, on sandstone, J. Vickery 1.1.1958 (NSW 46082–46086); between Mt. York and Mt. Victoria, J. Vickery 1.1.1958 (NSW 46087); Mt. Victoria, E. Cheel 12.1901 (NSW 39106); Mt. Victoria, J. Vickery 4.1931 (K; BRI) and 11.1930 (NSW 39097; K); Blackheath, L.A.S. Johnson 9.12.1959 (NSW 48990); Blackheath, C.T. Musson 1.1914 (NSW 39078); Katoomba, W.F. Blakely 11.1932 (NSW 39096); Cox's River, A. Cunningham 1824 (K); Port Jackson, R. Brown No. 6290 in part, 1802–5 (BM; K); Cheltenham, J. Vickery 27.11.1954 (NSW 46126); Gladesville, H. Deane 11.1884 (NSW 46067); Parramatta River, J.L. Boorman 11.1914 (NSW 39079); Parramatta, Woolls (MEL; K); Rookwood, E. Cheel 14.10.1899 (NSW 9070, 39083; K); Hurstville, J.H. Camfield 10.1897 (NSW 9071; K); Glenfield, E. Cheel 19.11.1924 (NSW 46121); Rockley Mt., 11 miles S of Bathurst, C.K. Ingram 20.11.1960 (NSW 53493); Oberon to Hampton road, J. Vickery 3.1.1955 (NSW 46061); Oberon, 4400 feet (NSW 39091); Oberon, Ralph 1.1918 (NSW 39084); near Beaconsfield, S of Oberon, J. Vickery 25.1.1959 (NSW 50162, 57747); Mt. Werong, R.H. Cambage No. 3160, 4.12.1911 (SYD); Ruby Creek to South Head, Mt. Werong, 3400 feet, L.A.S. Johnson & E.F. Constable 23.10.1951 (NSW 18682); Taralga, F.A. Rodway 12.1921 (NSW 39085); ca. 2 miles S of Fitzroy Falls, J. Vickery 5.1.1959 (NSW 47002); Kingsvale via Young, C.K. Ingram 24.11.1960 (NSW 53492); Crookwell district, R.W. Shelley 5.12.1962 (NSW 58963); Boorowa district, C. Dickson 11.12.1955 (NSW 46066); Mittagong, near "The Lake", 2000 feet, L.A.S. Johnson 30.12.1955 (NSW 39074); Mt. Jellore, E. Cheel 16.11.1912 (NSW 9048; K); Temora, J.W. Dwyer 10.1915 (NSW 57750); The Rock, near Wagga Wagga, T.H. Patterson 10.1916 (NSW 9064; K); N of Laggan, A.J. Anderson 11.1949 (CANB); Barbers Creek, J.H. Maiden 12.1897 (NSW 39089); Shoalhaven Gorge, McNeur 30.11.1950 (CANB); Abercrombie Caves, C.K. Ingram 18.10.1959 (NSW 53494); Endrick River Crossing, near Nerriga, F.A. Rodway 27.11.1932 (NSW 39076); Nerriga, F.A. Rodway 27.11.1932 (NSW 39146; K); Braidwood district, W. Bäuerlen No. 85, 10.1886 (MEL); Foxlow, N of Captains Flat, J. Vickery 1.4.1956 (NSW 39082); between Captains Flat and Braidwood, near crest of the range, J. Vickery 12.1.1956 (NSW 39087); ca. 2 miles from Captains Flat on Braidwood road, J. Vickery 12.1.1956 (NSW 39086); Acton/Turner area, Canberra, R. Pullen No. 1986, 20.11.1959 (CANB; NSW 57295) and No. 1949, 6.11.1959 (CANB; NSW 57299); lower E slopes of Black Mountain, Canberra, R. Pullen No. 1972, 13.11.1959 (CANB; NSW 57304); Black Mountain, E. Gauba 27.10.1949 and 12.12.1949 (CBG; ANU); Black Mountain (CANB 14949; K); Black Mountain, Canberra, R. Pullen No. 2365, 18.11.1960 (CANB; NSW 63656); near Black Mountain Reservoir, Canberra, ca. 2100 feet, R. Pullen No. 2976, 30.11.1961 (CANB; NSW 63652); Molonglo River, E. Gauba 17.12.1949 (CBG 003028; ANU); rocky slopes above Murrumbidgee River, near Cotter, McNeur 11.1950 (CANB); Upper Cotter River Valley, ca. 3500 feet, R. Pullen No. 2452, 14.12.1960 (CANB); Cotter Dam Lookout, M. Tindale 16.1.1954 (NSW 39145); Coree Creek at Five Fords, amongst stones on slope above creek, N.T. Burbidge No. 1833, 13.1.1948 (CANB); above Blundell's Flat, Coree Creek, ca. 3000 feet, R. Pullen No. 2996, 6.12.1961 (CANB; NSW 63653); Gudgenby to crossing of Gudgenby River, steep slope of granite hill, N.T. Burbidge & M. Gray No. 6223, 23.12.1958 (CANB; NSW 51342); 5 miles SSW of Brindabella, ca. 2200 feet, B.G. Briggs 26.12.1960 (NSW 52863, 52864); Brindabella Range, wet sclerophyll forest, R. Story No. 7652, 1.11.1961 (CANB; NSW 57656); Piccadilly Circus, on road to Mt. Franklin, J. Vickery 25.1.1964 (NSW 67717); Mt. Franklin, open ground near Chalet, N.T. Burbidge No. 2796, 23.3.1948 (CANB; NSW 46070) and No. 2798, in shelter of Chalet (CANB); near Mt. Franklin, ca. 5000 feet, S.T. Blake No. 13884, 19.1.1939 (BRI; NSW 39092); summit of Bimberi Peak, near Trig. Station, 6264 feet, R.H. Cambage No. 3452 in part, 15.1.1912 (NSW 70276); 9 miles NNE of Rules Point, ca. 4400 feet, dry slope, grassland in treeless valley, B.G. Briggs 25.12.1960 (NSW 52860); 8 miles NNE of Rules Point, ca. 4400 feet, well-drained slope in subalpine grassland, in treeless valley, B.G. Briggs 25.12.1960 (NSW 52862); McKeahnies Creek, Upper Tumut, J.C. Newman 1.1952 (NSW 46023); 8 miles NE of Kiandra, ca. 4000 feet, dry glassland slope near edge of woodland in valley, B.G. Briggs 25.12.1960 (NSW 52864); crest of Sawyer's Hill, 2 miles E of Kiandra, J. Vickery 20.1.1958 (NSW 46074); near Kiandra, J. Vickery 20.1.1958 (NSW 46075); near Kiandra, M.E. Phillips No. 2761 and 2762, 31.1.1956 (NSW 39104, 39105); King's Cross, ca. 8 miles WSW of Kiandra, J. Vickery 20.1.1958 (NSW 46078); Cabramurra to King's Cross, M.E. Phillips 2.2.1956 (NSW 39179); Cabramurra, on T2 track, M. Mueller No. 3042, 1955 (NSW 39195); Tantangara turn-off, 10 miles S of Kiandra, E. Reiner No. 493, 26.12.1960 (CANB); Happy Jacks Plain, headwaters of Happy Jacks River, ca. 15 miles S of Kiandra, J. Vickery 17.1.1958 (NSW 46069, 46076, 46077); Happy Jacks Plain, grassland near Brook's Hut, M.E. Phillips 18.12.1954 (NSW 46059); Happy Jacks, near huts, M.E. Phillips 9.1.1963 (CBG 003074); Digger's Creek, Happy Jacks Plain, M.E. Phillips & M. Dettman, 13.1.1955 (NSW 39207, 39208); Barney's Creek, part headwaters of Happy Jacks River, ca. 16 miles SW of Kiandra, J. Vickery 21.1.1958 (NSW 46080, 46081); cult. at Cooma from plant from Happy Jacks Plain, M.E. Phillips 25.11.1959 (NSW 50291); Toolong Range near Round Mountain, W of the divide on Tooma Dam site road, ca. 18 miles SW of Kiandra, J. Vickery 20.1.1958 (NSW 46073, 46079); Tooma road, M.E. Phillips 10.2.1956 (NSW 46153); Tibeaude Creek hut, edge of Happy Jacks catchment, subalpine woodland, M. Mueller & J. Warren 22.1.1954 (NSW 39203); junction of pilot track to Burns Creek and Tooma road, M.E. Phillips 3.2.1956 (NSW 39178); Bald Mountain Creek valley, on scree, M. Mueller 19.12.1952 (NSW 39184); ca. 3 miles E of Cooma on Nimmitabel road, R. Pullen No. 3951, 20.11.1963 (CANB; NSW 64697); near Berridale, J. Vickery & M.E. Phillips 6.1.1956 (NSW 50979); Jindabyne, J.H. Maiden & W. Forsyth 1.1899 (NSW 39081); near Sawpit Creek nursery, M.E. Phillips No. 3074, 2.12.1955 (NSW 39080); Sawpit nursery site, M.E. Phillips No. 2825, 24.1.1957 (NSW 46152); Island Bend Camp, M. Mueller & J. Warren 16.12.1953 (NSW 39183); Island Bend, N.C. Beadle

4.2.1952 (SYD); Snowy Valley Road between Island Bend and Kosciusko turn-off, on hillside in open forest, J. Vickery & M.E. Phillips 11.1.1956 (NSW 39542); junction of Wragge's and Piper's Creeks, Kosciusko Plateau, J. Vickery & M.E. Phillips 9.1.1956 (NSW 39191); Diggers Creek, near Hotel Kosciusko, 5000 feet, L.A.S. Johnson & E.F. Constable 20.1.1951 (NSW 15975); Rennix Gap, N.T. Burbidge No. 3713, 23.2.1952 (CANB; NSW 46071); Daners Gap, Kosciusko Plateau, J. Vickery 6.1.1956 (NSW 39189); Kosciusko, 5000 feet, E. Gauba 16.1.1957 (CBG 003041; ANU); Mt. Kosciusko, W. Hartley & J. Calvert 20.12.1930 (K); Mt. Kosciusko, 4500–5000 feet, W. Hartley & J. Calvert 20.12.1930 (CANB); Cooma, cult. from plant from near Wambrook Radio Station, M.E. Phillips 7.1.1957 (NSW 46063); Wambrook, M.E. Phillips 31.1.1956 (NSW 39103); Alpine Highway at Bundilla Landslide, M.E. Phillips 25.1.1956 (NSW 39102); The Pinnacle track at Grass Flat Creek, Geehi River area, J. Vickery 9.1.1959 (NSW 47010); near Geehi River, under forest, J. Vickery 9.1.1959 (NSW 47008); Alpine Highway between Tom Groggin and Geehi, M.E. Phillips 25.1.1956 (NSW 39506); Alpine Highway at the Pilot Lookout, M.E. Phillips 25.1.1956 (NSW 39541); Waterfall Creek near Jacobs River, S of Kosciusko, M.E. Phillips & J. Raeder-Roitzsch 10.1.1957 (NSW 46151); Thatcher's Hole Creek, between Moonbah and Jacobs River, M.E. Phillips & J. Raeder-Roitzsch 10.1.1957 (NSW 46062); ca. 12 miles N of Tathra, J. Vickery 5.4.1958 (NSW 46091); and many others.

VICTORIA: Ca. 6 miles and ca. 7 miles S of Upper Nariel at top of divide, J. Vickery 10.1.1959 (NSW 47017, 47022); cult. at Cooma (N.S.W.) from plant from Upper Nariel, J. Vickery & M.E. Phillips 25.11.1959 (NSW 50298); Bogong High Plains, ca. 5500 feet, subalpine grassland, J. Vickery 14.1.1959 (NSW 47005); Mt. Buffalo, J. Vickery 9.4.1958 (NSW 46072) and 13.1.1959 (NSW 70270); Mt. Buffalo, 4500 feet, H.C.E. Stewart 10.1.1950 (BRI); 8 miles ESE of Hotham Heights on Omeo road, J. Vickery 11.1.1959 (NSW 47016); Mt. Feathertop, 2600 feet, A.J. Tadgell, 1.1918 (MEL); Cobboras Mountains, 5–6000 feet, and 6000 feet, F. Mueller (MEL); Bidwell, Upper Delegate River, subalpine, N.A. Wakefield Nos. 4815, 4818, 19.1.1953 (NAW); Little River, Wulgulmerang, 2800 feet, N.A. Wakefield No. 4814, 20.1.1953 (NAW); W. Tree, Gippsland, N.A. Wakefield No. 2726, 3.1.1949 (NAW); Betka River, near Mallacoota, in near-coastal sandy heath, N.A. Wakefield Nos. 4816, 4819, 1.1.1953 (NAW); Cann River, N.A. Wakefield No. 2112, 25.11.1947 (NAW; NSW 39088); Orbost area, N.A. Wakefield No. 3345, ca. 1946 (NAW); between Cape Couran and Marlo, N.A. Wakefield No. 2540, 1.1.1948 (NAW; NSW 46120; MEL); about 6 miles W of Lakes Entrance on the Metung road, T.B. Muir No. 1970, 27.11.1960 (MEL; NSW 85383); ca. 8 miles W of Lakes Entrance on the Metung road, T.B. Muir Nos. 1978, 1979, 27.11.1960 (MEL; NSW 85382, 85384); near Kallista, Dandenong Range, S.T. Blake No. 7306, 22.1.1935 (BRI); Mt. Macedon, M. Tindale 15.1.1967 (NSW 84375); Bendigo, F. Robbins 26.10.1947 (ACB 7690; NSW 85580); Creswick, J.H. Willis 11.1928 (MEL); Ballarat, G. Day 1887 (MEL); Henty Highway, 25 miles from Horsham near Brimpaen turn-off, T.B. Muir No. 1560, 23.10.1960 (MEL; NSW 85402); Ararat, McDonald Park wildflower reserve, A.C. Beauglehole No. 21707, 15.11.1966 (NSW 85575); and others.

TASMANIA: Archer (NSW 45674); Gunn No. 1010, 11.12.1837 (K), one of 3 sheets cited by Hooker sub *P. australis* var. *sieberana*; CH (? Circular Head), Gunn No. 596 in part, 19.12.1837 (K); Lake St. Clair, J. Vickery 19.1.1949 (NSW 53038); Mathinna Plains, ca. 2500 feet, M.E, Phillips No. 483, 29.1.1962 (CBG 003073; NSW 57022); New Norfolk, Gunn No. 596 in part. 11.12.1840 (K), one of the sheets cited by Hooker sub *P. australis* var. *sieberana* (the sheet also bears 1 plant of *P. rodwayi* and 2 plants of *P. gunnii*); Hobart Town, Gunn No. 596, 14.12.1840 (K), one of the sheets named by Hooker *P. australis* γ; Risden Hill, M.E. Phillips No. 364, 8.11.1960 (CBG 003047; NSW 53002); Blackman's Bay, wet heath, W.M. Curtis 1.1945 (HO; K).

var. **cyanophylla** *Vickery*, **var. nov.**

A var. *sieberana* laminis capillaribus, praecipue in vivo cyaneis, 3–10 cm. longis, ligulis saepe 1–2 mm. longis, planta aliquantum parva caespitosa surculis intravaginalibus sed aliquando extravaginalibus, interdum aliquantum stolonifera fasciculis surculorum intravaginalium vel aliquando extravaginalium, lemmatis dorsorum in parte inferiore pubescentibus vel glabris differt.

HOLOTYPE: NEW SOUTH WALES, near Penderlea, W of Jindabyne, J. Vickery 8.1.1959 (NSW 50159).

Leaves capillary, often bluish especially in vivo, 3–10 cm. long, with ligules often 1–2 mm. long. Plant rather small, caespitose with mostly intravaginal but occasionally extravaginal shoots, occasionally somewhat stoloniferous with fascicles of intravaginal or occasionally extravaginal shoots at the nodes. Lemmas pubescent to glabrous on the lower part of the back. Plate IX, 2.

Central and Southern Tablelands of New South Wales.

New South Wales: 4-Mile Creek, Orange, C.K. Ingram 19.11.1960 (NSW 57748); Ovens Range, C.K. Ingram 13.12.1964 (NSW 72253, 72254); Werong Range, 25 miles S of Oberon, E.F. Constable No. 4104 in part, 29.11.1962 (NSW 59217); Bundanoon, along road to the Gullies, dense tufts on bank, heavy eucalypt forest, M. Tindale 18.11.1954 (NSW 39138); Wingello, J.L. Boorman 12.1913 (NSW 39143); Goulburn, J. Vickery 3.11.1931 (NSW 39139); Kowen Forest, NE A.C.T., 2550 feet, R. Pullen No. 4229, 8.12.1966 (CANB; NSW 85416); Black Mountain, Canberra, H.S. McKee No. 8848, 10.12.1961 (NSW 60461); Devils Creek, damp gully, E. Gauba 27.12.1949 (CBG; NSW 85417); Devils Creek, E. Gauba 13.1.1950 (CBG); Murrumbidgee and Cotter junction, R.H. Cambage No. 2985, 5.11.1911 (SYD; NSW 39144); Coree Creek at Five Fords, densely tufted grass with green (not glaucous) leaves growing under shrubs on stony slopes a little way up from creek, N.T. Burbidge No. 1825, 13.1.1948 (CANB; K; NSW 46154); summit of Mt. Coree, Brindabella Range, rocky summit area in crevices, bluish foliage, R. Pullen No. 2951 (CANB; NSW 64696); Mt. Franklin Chalet, D.E. Symon & M.V. Carter 16.1.1952 (ADW 19040 in part); Burrinjuck Road, deep soil on sedimentary rock, C.W.E. Moore No. 2178, 16.12.1952 (NSW 39533); Monaro district, W. Bäuerlen No. 193, 12.1886 (MEL); Section Creek, Tumut River catchment area, J.C. Newman 15.1.1953 (NSW 39532); between Cooma and Kiandra, ca. 3180 feet, on stony ridge, R. Pullen No. 3980, 17.12.1963 (CANB; NSW 69432); Eucumbene Portal, Snowy Mts., forest community, ca. 3700 feet, M.E. Phillips 27.1.1965 (CBG; NSW 82084); Snowy Lookout, between Eucumbene Dam and Happy Jacks, M.E. Phillips 13.1.1963 (CBG); Tantanjara, in dry grassland, M.E. Phillips & J. Raeder-Roitzsch 6.1.1960 (NSW 50295); Tributary of Bundara Creek, Nimmo Region, E side, in *E. pauciflora—E. stellulata* forest, M.E. Phillips 25.11.1954 (NSW 64681); Snowy Mountains Highway, ca. 17 miles N of Cooma, J. Vickery 22.1.1958 (NSW 50160); cult. at Cooma from plant from Penderlea, J. Vickery & M.E. Phillips 25.11.1959 (NSW 50293); Snowy Valley Lookout, above Jindabyne, M.E. Phillips No. 852, 14.12.1960 (CBG 003044; NSW 53001); Sawpit Nursery site, W of Jindabyne, M.E. Phillips No. 2825, 24.1.1957 (NSW 46152); Inspiration Point, Snowy Mts., E. Reiner No. 510, 27.12.1960 (CANB); Thredbo River, C.K. Ingram 3.1.1950 (KI).

This variety may at times be difficult to distinguish from fine-leafed forms of var. *sieberana* and it is even possible that some specimens of it have been included in the citation of specimens of that variety. The leaf-colour is much more evident in living than in dried material and its constancy is very difficult to judge from herbarium specimens. Glaucous-bluish forms of var. *sieberana* are not uncommon in some districts, especially the Central Tablelands of New South Wales, but are not otherwise distinctive. In the field, however, it has appeared to me that var. *cyanophylla* does form a distinct, somewhat diffuse population. It maintained its rather different growth habit in culture experiments conducted by Dr M.E. Phillips in the Snowy Mountains Hydro-Electric Authority nursery at Cooma. Many herbarium specimens, however, very inadequately represent the growth habits of the plant collected.

var. **hirtella** *Vickery*, var. nov.

A var. *sieberana* innovationibus intravaginalibus vel saepe extravaginalibus, laminis remote vel parce hirsutis pilis brevibus rigidis 0·2–0·5 mm. longis vel longe scabridis, vaginis glabris vel scabris vel parce hirsutis vel lente pubescentibus differt.

Holotype: New South Wales: Ardlethan, J.L. Boorman 12.1917 (NSW 57759).

Differs in the rather frequent production of extravaginal as well as intravaginal innovations, in the blades being distantly to rather sparsely hirsute with short, stiffly spreading hairs 0·2–0·5 mm. long or long-scabrous, and in the sheaths being variously glabrous, scabrous, more or less hirsute or softly pubescent. Plate XI, 4–7.

From south-east Queensland, through the Tablelands of New South Wales to the South Western Slopes and Western Plains east of the Darling River, to Victoria.

Queensland: Applethorpe, Swimming Hole, S.L. Everist & L.J. Webb Nos. 1306, 1316, 22.11.1946 (BRI; K; CANB).

New South Wales: Glen Innes, E. Cheel 8.12.1924 (NSW 57772); Glen Innes district, J.B. Noonan 12.1949 (NSW 57762); 25 miles NW of Guyra on road to Tingha, R. Roe No. AR630, 13.12.1948 (CANB); Guyra, J. Vickery 30.12.1934 (NSW 57765); 8 miles S of Guyra on New England Highway, J. Vickery 9.1.1958 (NSW 57767); Head of the Gwydir, Leichhardt 13.4.1845 (NSW 57763); 3 miles N of Stannifer on road to Elsmore, R.W. Jessup & M. Gray 10.3.1954 (CANB); Barraba, L.J. Durham 20.11.1952 (NSW 57764); 10 miles S of Armidale on New England Highway, J. Vickery 9.1.1958 (NSW 57769); Jeogla, C.K. Ingram 27.12.1960 (NSW 57777); 7 miles W of Yarrowyck on Toryburn road, R.W. Jessup & M. Gray 4.3.1954 (CANB); 23 miles W of Yarrowyck, R.W. Jessup & M. Gray 6.11.1953 (CANB); 9 miles S of Kentucky turn-off on Uralla-Bendemeer road, R.W. Jessup & M. Gray 7.4.1952 (CANB); 4 miles towards Toryburn from Walcha-Retreat turn-off, R.W. Jessup & M. Gray 10.11.1953 (CANB); Gunnedah district, W.A. Trimmer 12.1965 (NSW 89944); 3 miles N of Wallabadah, R.H. Goode Nos. 112, 114, 11.11.1954 (NSW 57768, 57773); Loomberah district, near Tamworth, R.H. Goode No. 171, 17.11.1954 (NSW 57770); Molong, J.L. Boorman 11.1906 (NSW 57760); Tottenham, N.C. Beadle 2.1941 (SYD); Cobar, J.M. Curran 7.1887 (MEL); Cobar, H. Andrae 1887 (MEL); Gunning Ra., near Lagoon, 18 miles W of Forbes, C.K. Ingram 17.11.1956 (KI); Lachlan Ra., rocky hillside, at 750 feet, E.F. Constable 29.10.1947 (NSW 4596); Ariah Park to Coolamon road, O.R. Southwood 22.10.1963 (NSW 63740); Blundell's, A.C.T., J. Calvert 18.12.1930 (CANB); Canberra, J.B. Paltridge 6.10.1931 (CANB); lower E slopes of Black Mountain, R. Pullen No. 1974, 13.11.1959 (CANB; NSW 57774); Gunning Gap, B. Whitehead No. 1198, 3.11.1963 (NSW 67680); Narraburra–Trundle Hills, Temora–Barmedman, J.W. Dwyer 10.1915 (NSW 9065; K); Temora, J.W. Dwyer 10.1915 (NSW 9067; K); Uriarra Crossing, Murrumbidgee R., ca. 1400 feet, R. Pullen No. 2959, 15.11.1961 (NSW 57365) and No. 2960 (NSW 57775); 3 miles from Bulls Head towards Mt. Franklin, M. Tindale 25.1.1964 (NSW 67716); Cavan Gap, E. Gauba 17.12.1949 (CBG); Gilmore near Tumut, J.L. Boorman 10.1916 (NSW 39671, 57758); Ardlethan, R.H. Cambage No. 4241, 1.10.1916 (NSW 9066; K); Upper Murray, C. French 1886 (MEL); 2 miles SE of Balldale, E.J. McBarron No. 6045, 3.12.1952 (EJMcB); Jindera, E.J. McBarron No. 5095, 10.10.1950 (EJMcB; SYD); Albury, on Howlong Road, E.J. McBarron No. 1176, 21.10.1947 (NSW 57779); Albury, E. Cheel 10.1928 (NSW 9068; K); Monument Hill, Albury, E.J. McBarron No. 3756, 12.10.1949 (EJMcB); Little Billabong, Albury district, G.R. Godden 7.12.1955 (NSW 57757); Mulwala, J.J. Fletcher 10.1890 (NSW 57756).

Victoria: Hume (Murray) River, Wodonga, J.N. McKibbin 10.1887 (MEL); 6 miles N of Wangaratta on the Yarrawonga road, T.B. Muir No. 1690, 1.11.1960 (MEL; NSW 85405); Omeo, A. Meebold No. 21585, 12.1936 (NSW 39597); ca. 8 miles SW of Omeo on Hotham road, dry grassland under trees, J. Vickery 11.1.1959 (NSW 47019); on crest of ridge between Bright and Mt. Beauty, J. Vickery 14.1.1959 (NSW 47018); Noorangong, A. Meebold No. 21582, 1936 (NSW 57761); Donald, Curdie (MEL); near Dimboola (MEL); Daylesford, R. Wallace 1878 (MEL); Combienbar road, Bemm River, at Jungle, F. Robbins ca. 1937 (ACB 7412; NSW 85573); Dunolly, on Murder's Hill, M.E. Phillips 30.10.1963 (CBG; NSW 82083); Castlemaine, R.J. Kendall No. 136, 24.11.1860 (K); Gorae West, W of Portland, A.C. Beauglehole No. 592, 11.1945 (ACB); Wyperfield National Park, J. Landy & A.C. Beauglehole No. 7147, 4.11.1960 (NSW 85581); Grampians, Victoria Range, A.C. Beauglehole No. 4786, 4.2.1959 (NSW 85583).

It is quite evident that a greater knowledge of the biology of these plants is required before a satisfactory taxonomic conclusion can be reached regarding the significance of var. *hirtella*. In most populations of *P. sieberana* var. *sieberana* examined it is evident that growth of the tussock takes place almost entirely by intravaginal shoots, while extravaginal shoots are rarely produced. Some specimens, however, particularly from lower rainfall localities, suggest that extravaginal shoots are not uncommon, even in specimens that differ in no other respect, though this character can by no means be verified on all herbarium specimens. To what extent this habit is influenced by habitat conditions, such as the yearly cutting back of the tussock by grazing, fire, drought etc. is at present a matter of conjecture and must await future experiment.

Similarly the degree of hair production on the foliage is so variable that its taxonomic significance in this instance is uncertain. The taxon is recognised at present for reasons of convenience. The presence of these occasional hairs (which may be manifest only on some of the leaves of a tussock) invites comparison with *P. induta*, *P. petrophila*, *P. rodwayi*, *P. morrisii* and *P. crassicaudex*, for which purpose the characters provided in the key to the species should prove helpful.

32. P. hiemata *Vickery*, **sp. nov.**

Gramen perenne, modice breve, glabrum, in vivo manifeste viride, dense caespitosum, fere intravaginale, fasciculis densis surculorum, saepe gracillimis fragillissimisque, rhizomata verticales formantibus. Culmi 15–60 cm. alti, supra folia inferiora ca. 2–nodi, laevi vel sub panicula leviter scabri, subteretes. Nodi glabri. Folia plerumque basi. Vaginae laeves vel sublaeves, glabrae, tenues, saepe aliquanto lucentes, inferiores saepe purpurascentes vel tandem pallido-fuscae. Ligula firme membranacea, truncata, ca. 0·5 mm. longa, ad apicem minute ciliolata, ad dorsum minute scabra. Laminae 5–25 cm. longae, firme plicatae vel convolutae et plus minusve compresso-teretes, graciles, aliquanto lucentes praesertim in vivo, plerumque laeves, erectae vel tandem flaccescentes, haud vel exigue rigidae, in vivo manifeste virides, superficiibus interioribus plus minusve dense scabro-pubescentibus. Panicula 5–12 cm. longa, tandem pyramidalis, ramis delicate patentibus filiformibus in dimidio inferiore sine spiculis, supra spiculis paucis, rhachide ramis ramulisque scabris, ramis inferioribus 1–3–natis. Spiculae compressae, ovatae, purpurascentes vel viridescentes vel raro flavido-viridescentes, 3–5–flores. Glumae 3–nervatae, acutae vel breve acuminatae, modeste latae, ad carinas leviter scabrae, superior quam inferior aliquanto longior. Aranea 0 vel brevis macilentaque. Lemma ca. 2–3·5 mm. longum, firmum, oblongo-lanceolatum, acutum vel obtusum, 5–nervatum, ad partem inferiorem posteriorem pubescens, ad carinam pilis aliquando parce longioribus, sursum glabrum. Palea ad carinas supra tenuiter scabra infra ciliolata, ad dorsum pubescens vel scabro-pubescens. Antherae 1·5–2 mm. longae, flavae.

HOLOTYPE: NEW SOUTH WALES: Mt. Kosciusko, 5000–7000 feet, R. Helms 2.1893 (NSW 39172).

Moderately short, glabrous, very green in vivo, densely caespitose perennial with dense tufts of intravaginal shoots from the lower nodes, the erect or obliquely erect connecting internodes often very slender and fragile forming elongate vertical rhizomes, without or extremely rarely with an extravaginal shoot. Culms 15–60 cm. high, slender, about 2–noded above the basal leaves, smooth, or lightly scabrous below the panicle, subterete. Nodes glabrous. Leaves mostly basal. Sheaths smooth or almost so, glabrous, rather thin, often somewhat shining, compressed, the lower usually pallid, very rarely slightly purplish. Ligule firmly membranous, truncate, about 0·5 mm. long, minutely ciliolate at the apex, finely scabrous on the back. Blades 5–25 cm. long, closely folded or convolute and more or less compressed-terete, slender, somewhat shining especially in vivo, generally smooth to the touch or if slightly scabrous (especially towards base and apex) then at least silky smooth, when the fingers are drawn upwards along the blades, erect, or slightly drooping when older, not or scarcely rigid, very green when fresh, closely scabrous-pubescent on the inner surface. Panicle 5–12 cm. long, pyramidal at maturity with delicately spreading, filiform branches devoid of spikelets in their lower half and with few spikelets above, the rhachis, branches and pedicels scabrous, the lower branches 1- to 3-nate. Spikelets compressed, ovate, purplish, greenish or more rarely yellowish-green, 3- to 5-flowered. Glumes 3-nerved, acute to shortly acuminate, moderately broad, lightly scabrous on the keels, the upper slightly larger than the lower. Web absent or scanty and rather short. Lemma ca. 2–3·5 mm. long, firm, oblong-lanceolate, acute to obtuse, pubescent all over the back in the lower part, the hairs on the keel sometimes slightly longer, glabrous upwards, 5-nerved. Palea finely scabrous on the keel above, ciliolate below, pubescent to scabrous-pubescent on the back. Anthers 1·5–2 mm. long, yellow. Plate IX, 3.

At high elevations on the Australian Alps, and on the Brindabella Range in New South Wales.

New South Wales: Summit of Bimberi Peak, near Trig. Station, 6264 feet, R.H Cambage No. 3452 in part, 15.1.1912 (NSW 70277; SYD) and at 6200 feet, No. 3447 in part (NSW 70111); summit of Mt. Coree, ca. 4663 feet, in granite crevice, a common tufted grass, R. Pullen No. 2952, 15.11.1961 (CANB; NSW 57366); Guthega River, M.E. Phillips 23.1.1958 (NSW 47012); western tributary of Trapyard Creek, in *Eucalyptus niphophila* woodland, M.E. Phillips 25.1.1957 (NSW 46128, 46129); Tooloom Range, near Round Mountain, W of the Dividing Range on Tooma Dam site road, ca. 18 miles SW of Kiandra, J. Vickery 20.1.1958 (NSW 46130); Cosjack's Hut, headwaters of Doubtful River, 5800 feet, Barlow & James 2.1954 (NSW 39202); Valentine River, C.E. Chadwick 31.1.1966 (NSW 90110); Rock Creek, Kosciusko Region, M.E. Phillips 26.1.1956 (NSW 39182); Upper Tooma region, B. Barlow & S. James 2.1954 (NSW 39187); Kosciusko road, below Sugarloaf, M.E. Phillips 20.1.1956 (NSW 39177, 39212); near Bett's Camp, Kosciusko Plateau, M.E. Phillips, M. Dettman & R. Izon 19.1.1955 (NSW 39180); Kosciusko Plateau, just above swamp nearest to Daners Gap on Plains of Heaven track, J. Vickery & M.E. Phillips 9.1.1956 (NSW 39174, 39190); above Charlotte Pass at 6200 feet, open alpine moor, N.T. Burbidge Nos. 3763, 3764, 24.2.1952 (CANB; NSW 46131, 46132); Mt. Kosciusko, R. Helms 2.1893 (NSW 39173); near Mt. Kosciusko, at 6000 feet, J. Vickery 13.1.1940 (NSW 9058; K); Mt. Kosciusko, tree-line to 7000 feet, J.H. Maiden & W. Forsyth 1.1899 (NSW 39193, 39204); Mt. Kosciusko, at the summit, J. Vickery & M.E. Phillips 7.1.1956 (NSW 46137); Mt. Kosciusko, above tree-line, J.B. Cleland 18.12.1910 (NSW 46136; AD); Thredbo River gorge, 5600 feet, L.A.S. Johnson & E. Constable 19.1.1951 (NSW 18684).

Victoria: 1 mile E of Hotham Heights, dense soft tussocks on ridge in subalpine grassland, J. Vickery 11.1.1959 (NSW 47009); on ridge between Mt. Hotham and Mt. Loch, J. Vickery 12.1.1959 (NSW 47007); Echo Flat, Lake Mountain, ca. 4700 feet, 10 miles NE of Maryville, J.H. Willis 6.2.1943 (MEL; K); on track to Echo Flat, Lake Mt., ca. 4800 feet, in *E. niphophylla* woodland, M.E. Phillips 15.1.1961 (CBG 003054; NSW 53500); Lake Mountain, Echo Flat, subalpine grassland, E.J. Carroll 22.12.1965 (CBG); Bogong High Plains, ca. 5500 feet, Rocky Knobs, head of Rocky Valley, J.H. Willis 10.1.1946 (MEL 46 and 46a; K); Bogong High Plains, southern slope of Mt. Nelson, 5800 feet, T.B. Muir No. 1046, 11.1.1960 (NSW 70808); Bogong High Plains, waterfall between Niggerheads and Mt. Fainter, A.C. Beauglehole No. 22514, 26.1.1967 (NSW 85451); Bogong High Plains, J.S. Turner 1.1946 (MEL); summit of the Cobboras Mountains, J. Stirling No. 73, 20.1.1885 (MEL; K); Bogong High Plains, ca. 5500 feet, J. Vickery 14.1.1959 (NSW 70808); Mt. Baw Baw, M. Tindale 22.1.1967 (NSW 85413, 98003).

This is the "Soft Snow Grass" of the alpine and subalpine moors and meadows chiefly above 5,000 feet and especially characteristic of the treeless "plains" of the Australian Alps. It is clearly closely related to *P. sieberana* which is often closely associated with it on the drier slopes and adjacent woodlands. It can be distinguished from *P. sieberana* by its brighter green colour and soft smooth leaves, but some intergradation appears to occur between them. In general, however, the tussocks can be distinguished in the field even when closely associated and clones have maintained their characteristics in cultivation at Cooma. In the Victorian Alps it may occur in association with the closely related *P. fawcettiae*, from which it can be distinguished by its much softer, less rigid foliage and pallid lower leaf-sheaths; the two were similarly distinguishable under cultivation at Cooma. In the wettest places of the alpine meadows, *P. hiemata* intermingles with and gradually gives place to *P. costiniana* which differs in the generally rather coarser and often stiffer leaves, the rather larger, coarser spikelets, usually larger lemmas on which the hairs are generally restricted to the keel and lateral nerves, and the palea scabrous but rarely ciliolate on the keels.

The "viviparous" condition of the spikelets is shown in a plant cultivated at Cooma from a plant from Daners Gap, M.E. Phillips & Van Lint 25.2.1956 (NSW 39188).

Specimens from Mt. Oberon, Wilsons Promontory (coll. M. Tindale 14.1.1967 (NSW 85415) and coll. L.A.S. Johnson 14.1.1967 (NSW 85411, 85414)) appear morphologically indistinguishable from *P. hiemata* though the locality is somewhat surprising.

33. P. fawcettiae *Vickery*, **sp. nov.**

Perenne laeve, rigidum, saepe caeruleum, glabrum, dense caespitosum, nodis inferioribus ramosissimis innovationibus intravaginalibus plerumque erectis vel obliquis. Culmi 20–60 cm. alti, subteretes, laevi vel leviter scabri, 1–2–nodi, nodis glabris. Vaginae inferiores plerumque plus minusve purpurascentes vel raro subfuscae, sublaeves, saepe sublucentes. Ligula 0·5–1·5 mm. longa, firme membranacea, obtusa vel truncata, ad dorsum puberula. Laminae rigidae, erectae vel obliquae, pleraque basi culmorum plus minusve caerulae, 4–35 cm. longae, firme plicatae vel plus minusve convolutae, compresso-teretes, pungentes, plerumque, laeves praeter saepe basin versus dense et minute scabrae. Panicula 3–18 cm. longa, tandem plus minusve pyramidalis ramis brevibus patentibus, saepe purpurascens sed aliquando flavido-viridescens, ramis inferioribus 1–5–natis, rhachide ramis pedicellisque scabris, ramis capillaribus infra medium sine spiculis. Spiculae compressae, 3–5–flores, ca. 5 mm. longae et sub anthesi aliquando latae. Glumae latiusculae, subacutae, 3–nervatae, ad carinas scabrae, superior quam inferior paullo longior. Aranea praesens vel exigua vel obsolescens. Lemma ca. 3–3·5 mm. longum, latiusculum, infra ad dorsum tenuiter dense vel sparse pubescens, obtusum, 5–nervatum, oblongum, firmum, sursum marginibus membranaceis. Palea ad carinas supra tenuiter scabra infra ciliolata, raro ubique scabra, ad dorsum dense pubescens. Antherae 2 mm. longae.

HOLOTYPE: VICTORIA: Bogong High Plains, ca. 5500 feet, in subalpine grassland, J. Vickery 14.1.1959 (NSW 51303).

Smooth often bluish, rather rigid, glabrous, densely caespitose perennial, abundantly branching at the lower nodes with intravaginal innovations so that the rhizome, if any, is generally vertical or obliquely erect. Culms 20–60 cm. high, subterete, smooth or faintly scabrous, 1- to 2–noded above the basal leaves, the nodes glabrous. Lower sheaths usually more or less purplish, fading to light brownish, more rarely pallid, subsmooth and often slightly shining. Ligule 0·5–1·5 mm. long, firmly membranous, obtuse to truncate, puberulous on the back. Blades rigid, erect or oblique, usually more or less bluish-green and glaucous, mostly basal, 4–35 cm. long, tightly folded and sometimes more or less convolute, compressed-terete, pungent-pointed, mostly very smooth except often densely and minutely scabrous towards the base. Panicles 3–18 cm. long, at length more or less pyramidal with short spreading branches, often purplish but occasionally yellowish-green, the lower branches 1- to 5–nate, the rhachis, branches and pedicels scabrous, the capillary branches devoid of spikelets in the lower half. Spikelets compressed, 3- to 5–flowered, ca. 5 mm. long and, at anthesis, almost as broad. Glumes rather broad, subacute, 3–nerved, scabrous on the keels, the upper slightly larger than the lower. Web present or scanty or obsolescent. Lemma about 3–3·5 mm. long, rather broad, finely and densely to lightly pubescent on the back in the lower part, obtuse, 5–nerved, firm with membranous margins upwards, oblong. Palea finely scabrous above and ciliolate or scabrous-ciliolate below on the keels, rarely scabrous throughout, densely pubescent on the back. Anthers 2 mm. long. Sometimes called "Horny Grass" in Victoria and "Smooth-blue Snow Grass" in New South Wales.

Australian Alps chiefly around 5,000–5,500 feet elevation.

NEW SOUTH WALES: Mt. Gingera, summit, M.E. Phillips 4.3.1965 (CBG); Tumut Pond Dam site, ca. 10 miles SW of Kiandra, J. Vickery 20.1.1958 (NSW 70116); Junction Shaft Gauging Station, M.E. Phillips No. 3664 in part, 5.1.1960 (NSW 50301); Nine-mile Diggings to Mt. Tabletop, S of Kiandra, M.E. Phillips No. 3249, 28.11.1959 (NSW 70114); junction of Tooma road and Burns Creek pilot track, M.E. Phillips 3.2.1956 (NSW 44399); near Bald Hill, above Happy Jacks catchment, M.E. Phillips 27.1.1965 (CBG); near Mt. Vale, Happy Jacks Plain, I. Staff 25.1.1957 (CBG); Happy Jacks Plain, M.E. Phillips 1.1955 (NSW 45593); hillside

between Happy Jacks River and Happy Jacks road in dry grassland, M.E. Phillips & M. Dettmann No. 2435, 12.2.1955 (NSW 45592); Schlink Pass, Kosciusko Plateau, J. Vickery 30.1.1964 (NSW 70112, 70117); Kosciusko road, near Munyang turn-off, J. Vickery 28.1.1964 (NSW 70113, 70115); Guthega River, M.E. Phillips No. 3472, 23.1.1958 (NSW 46903) and No. 3475 (NSW 47011); Kosciusko Plateau, middle bog on Plains of Heaven track, M.E. Phillips No. 2668, 22.2.1955 (NSW 44402); Lower Etheridge Range, M.E. Phillips 23.1.1956 (NSW 46139); between Mt. Kosciusko and Carruthers Peak on Blue Lake track above Lake Albina, in snow-patch, M.E. Phillips 9.2.1966 (CBG); near Carruthers Peak, Hj. Eichler 5.2.1957 (AD; NSW 85457); Thredbo River, Maiden & Forsyth 1.1899 (NSW 46138).

Victoria: Mt. Buffalo, J.B. Cleland 1.1913 (NSW 39205); Mt. Buffalo, 4500 feet, E.L. Robertson 11.2.1952 (ADW 7063); Mt. Buffalo, ca. 5000 feet, J. Vickery 13.1.1959 (NSW 46881, 46883, 46892, 46894–46897, 46901); Mt. Hotham, summit, C. Walter 1.1888 (MEL; NSW 39206); ridge between Mt. Hotham and Mt. Loch, J. Vickery 12.1.1959 (NSW 46899, 46902, 51304–51038); Mt. Feathertop, A.J. Tadgell 3.1917 and 12.1917 (MEL); Bogong High Plains, ca. 5000 feet, J. Vickery 14.1.1959 (NSW 46861); Mt. Bogong, on T-spur track near Cleve Cole Hut, Melbourne University Mountaineering Club 29.12.1964 (MEL); Bogong High Plains, summit of Mt. Nelson, 6175 feet, T.B. Muir No. 1038, 11.1.1960 (NSW 70810); Bogong High Plains, Towonga Huts, A.C. Beauglehole No. 22491 in part, 25.1.1967 (NSW 85454); Mt. Baw Baw, A.C. Beauglehole No. 15320, 22.1.1966 (NSW 85569); Baw Baw Mountains, T.G.A. Barnard 26.1.1914 (MEL); Mt. Mueller, Baw Baws, Gippsland, J.G. Luehmann & C. French 1892 (MEL; K); Mt. Buller, F. Mueller 22.3.1853 (MEL); Mt. Buller, 5720 feet, T.B. Muir No. 341, 29.1.1958 (MEL; NSW 85367); Mt. Buller, M.E. Phillips Nos. 142, 164, 1.1961 (NSW 64727, 64728); Grampians, Mt. William, at top, A.C. Beauglehole No. 22227, 13.11.1966 (NSW 85587).

This bluish, rather stiff-leafed tussock is found chiefly at elevations of 5,000–5,500 feet in the upper woodlands and tree-less subalpine meadows of the Australian Alps, sometimes in close association with *P. hiemata.*

P. fawcettiae seems most closely related to *P. hiemata*, *P. phillipsiana* and *P. sieberana.* From the first it differs in the more rigid, bluish leaves and purplish lower leaf-sheaths. From the other two it differs in the smooth polished surface of the leaves.

A few specimens from the Kosciusko region, especially near the summit (e.g. Maiden & Forsyth 1.1899 (NSW 9056; K)) appear intermediate between *P. fawcettiae* and *P. costiniana.* The leaves are rigid and purplish sheath bases may be present but, so far as can be judged on herbarium specimens, the foliage is not glaucous-green; the internerves of the lemmas are irregularly pubescent, differing in this even in a single collection on the respective panicles of separate fascicles which otherwise have every appearance of having been derived from the one tussock. I have not personally observed blue-leaved plants near the summit of Mt. Kosciusko.

Named in honour of Miss S.G.M. Fawcett (Mrs D.J. Carr) who has carried out extensive ecological and soil erosion studies in the Victorian Alps, and who first directed attention to this species.

34. P. crassicaudex *Vickery*, sp. nov.

Gramen perenne laxe vel densiuscule caespitosum, innovationibus aliquando extravaginalibus, internodis infimis saepe plus minusve turgidis et nodulos flavescentes elongatos vel interdum globulares formantibus. Culmi usque ad ca. 90 cm. alti, ca. 3–nodi, infra nodos et aliquando infra paniculam pubescentes, saepe aliquanto compressi, graciliusculi. Vaginae laxe vel dense pubescentes pilis tenuibus vel scabro-pubescentes, raro subglabrae, tandem laxae, inferiores aliquando macies et prope membranceae. Ligula obtusa vel truncata, ca. 1·5 mm. longa, firme membranacea, ad dorsum puberula, ad apicem integer vel minute ciliolata. Laminae planae vel convolutae, plerumque 15–30 cm. longae, 0·75–3 mm. latae, lineares, ad apices abrupte angustatos breves diminduendes, ad facies inferiores plus minusve laxe pubescentes vel scabro-pubescentes vel scabrae, ad facies superiores densiuscule pubescentes pilis longiusculis tenuibus. Panicula interdum aliquanto contracta vel patens, usque ad 17 cm. longa, ad apices ramorum breviorum spiculis aliquanto coarctis, ramulis et pedicellis brevibus scabris. Spiculae 3–5-flores, purpurascentes vel viridescentes vel tandem stramineae, compressae. Glumae acutae, latiusculae vel latae, inaequales inferiore paulo longiore, ad carinas et paulo ad lateres scabrae, inferior $\frac{3}{4}$–$\frac{4}{5}$ longitudinis lemmatis proximi. Aranea copiosa vel marcescens. Lemma 2–4 mm. longa, plerumque latiuscula, obtusa manifeste 5-nervata, infra ad lateres plerumque laxe pubescens, in dimidio inferiore carinam dense pilosa pilis longioribus et ad nervos laterales marginesque pilosa. Palea ad carinas sursum scabra in medio ciliolata, ad dorsum tenuiter pubescens. Antherae 1·5 mm. longae, flavescentes, aliquando purpurascentes.

Holotype: South Australia: Hindmarsh Tiers, J.B. Cleland 10.11.1950 (AD 95626061).

Loosely or rather densely caespitose perennial, the shoots often extravaginal from a contracted rootstock, with the basal internodes sometimes more or less strongly swollen to form usually elongate (or sometimes globular) yellowish nodules but these nodules not invariably apparent. Culms up to about 90 cm. high, ca. 3-noded, pubescent below the nodes and sometimes below the panicle, often slightly compressed, moderately slender. Sheaths loosely or closely pubescent with fine hairs or scabrous-pubescent or rarely subglabrous, at length becoming loose, the basal sheaths sometimes thin and almost membranous. Ligule obtuse or truncate, ca. 1·5 mm. long, firmly membranous, puberulous on the back, entire or minutely ciliolate at the apex. Blades flat to inrolled, mostly 15–30 cm. long, 0·75–3 mm. wide, linear but tapering towards the abrupt, short, acute, keeled apices, more or less loosely pubescent or scabrous-pubescent or scabrous on the lower (outer) surface, closely pubescent with rather long fine hairs on the upper (inner) surface. Panicle sometimes somewhat contracted at least in the upper part or the lower or all branches much spreading, up to 17 cm. long, with the spikelets rather crowded towards the ends of the short branches, the branches and short pedicels scabrous. Spikelets 3- to 5-flowered, purplish or greenish or ultimately straw-coloured, compressed. Glumes acute, moderately broad to broad, unequal with the upper a little longer, scabrous on the keels and slightly on the sides, the lower $\frac{3}{4}$ to $\frac{4}{5}$ as long as the adjacent lemma. Web usually moderately well developed, sometimes scanty or copious. Lemma 2–4 mm. long, usually rather broad, obtuse, distinctly 5-nerved, usually loosely pubescent on the internerves in the lower part of the back, densely and longer hairy on the keel in the lower half and on the lateral nerves and margins. Palea scabrous on the keel in the upper third and ciliolate in the middle third, finely pubescent on the back. Anthers 1·5 mm. long, yellow, sometimes purplish tinted, Plate XI, 3.

Victoria: Minyip, J.P. Eckert No. 113, 1890 (MEL; K); Mirranatwa Gap, on the Dunkeld to Halls Gap road, The Grampians, D.E. Symon 1.11.1961 (ADW 24440; NSW 57293).

South Australia: Clare, herb. J.M. Black 9.11.1920 (AD); Seven Hills, near Clare, herb. J.M. Black 23.11.1925 (AD); Port Germein Gorge, J.B. Cleland 20.10.1953 (AD); between Gladstone and Beetaloo, herb. J.M. Black 9.10.1908 (AD); Beetaloo Reservoir, J.B. Cleland 24.9.1942 (AD); Wirrabarra 11.11.1881 (AD); Prop. of Coleman, Saddleworth, D.E. Symon 27.10.1960 (ADW 23165); Androssan (AD); Gawler-town, F. Mueller 9.1878 (MEL); Mt. Crawford Pine Forest, M.E. Phillips 13.11.1962 (CBG 022989); Eagle-on-the-hill corner, near Adelaide, J.B. Cleland 26.12.1942 (AD); Beaumont Common, near Adelaide, J.B. Cleland No. H543, 11.10.1931 (K; AD) and 20.9.1942 (AD, 2 sheets); Mt. Lofty, E.H. Ising No. 2317, 21.12.1923 (K); Munno Para Hills, R. Tate 18.10.1879 (AD); Burnside, J.B. Cleland 21.10.1951 (AD); Strathalbyn, herb. J.M. Black 5.12.1910 (AD); Hartley, L.D. Williams 13.10.1952 (LDW); Morialta, J.B. Cleland 2.11.1935 (AD, 3 sheets); National Park, J.B. Cleland 26.11.1932 (AD, 3 sheets; BRI), 16.12.1939 (AD), 28.12.1943 (AD) and 27.11.1948 (AD); Belair, M. Koch No. 938, 11.1902 (NSW 43063; K; PERTH); Aldgate, J.B. Cleland No. H138, 11.1923 (K); Mt. Barker, F. Mueller 1848 (MEL); Mt. Barker, F. Liebelt 1938 (ADW 3725, 3726); summit of Mt. Barker, J.B. Cleland 14.12.1946 (AD); Clarendon, J.B. Cleland 13.10.1920 (AD); Summertown, J.B. Cleland 9.11.1940 (AD); near end of Spencers Gulf, Wehl (MEL); Krondgart, N.S. Tiver 29.10.1945 (ADW 5453); South East 12.1930 (ADW 517).

Together with *P. clelandii*, *P. crassicaudex* appears to be a fairly common species in South Australia, extending into western Victoria; it can generally be distinguished from the former, inter alia, by its narrower and usually finely hairy leaf-blades and/or -sheaths. Variability in its pubescence has, however, occasioned considerable difficulty in setting and defining its taxonomic limits. It appears to provide a link between the scabrous *P. sieberana* and its rather distantly hairy variety, var. *hirtella*, and the more densely hairy *P. induta*, *P. morrisii* and, frequently, *P. rodwayi*. Due to the common development of extravaginal shoots it seems unsatisfactory to associate it with these species. It is difficult to determine from herbarium specimens whether the production of almost nodular internodes at the base of the culm is of taxonomic significance in this instance or an ecological response, and this problem must await further field study.

35. P. rodwayi *Vickery*, sp. nov.

Perenne canum vel viride, caespitosum, 25–60 cm. altum, innovationibus intravaginalibus rarissime extravaginalibus vel rhizomate. Culmi gracillimi, plus minusve tereti, 1–2–nodi, sub nodis dense scabro-pubescentes vel puberuli, cetera tenuiter puberuli vel glabrescentes. Vaginae superiores densiuscule molle breveque pubescentes, inferiores haud purpurascentes. Ligula usque ad 1 mm. longa, obtuso-truncata, ad apicem ciliolata, ad dorsum scabra vel pubescens. Laminae graciles, convolutae, 8–30 cm. longae, ca. 0·3–0·75 mm. diametro, apicibus brevissimis carinatis, dense scabro-pubescentes pilis plus minusve aequalibus tenuissimis brevissimis rigidiusculis ca. 0·1 (raro usque ad 3) mm. longis vel densissime scabrae. Panicula laxiuscule contracta vel tandem patens, 5–15 cm. longa, ramis filiformibus, inferioribus 2–5–natis, infra medias sine ramulis spiculisque, ramis pedicellisque tenuiter scabris. Spiculae 3–5–flores. Glumae breviusculae, modeste latae, tenuiusculae, acutae vel subacutae, superior manifeste 3–nervata, inferior 1–3–nervata, ad carinas et aliquando sursum ad lateria tenuissime scabrae. Aranea instans sed exigua vel obsolescens. Lemma 2·5–3·5 mm. longum, lanceolatum, plerumque ad internervos pubescens, ad carinam et basi nervorum lateralium marginisque pilis densioribus longioribus. Palea ad carinas sursum tenuiuscule scabra, infra mediam plerumque ciliolata, ad dorsum tenuiter pubescens. Antherae ca. 1·5 mm. longae.

HOLOTYPE: TASMANIA: Domain (Hobart), L. Rodway 19.11.1929 (HO H1175).

SYNONYM: *Poa australis* var. *capillifolia* Hook. f., Fl. Tas. II (1858) 124; LECTOTYPE: Tasmania, New Norfolk, Gunn. No. 1468 (K). (Hooker also cited one other specimen of *P. rodwayi* and two of *P. hookeri* under the variety.) The epithet "*capillifolia*" is pre-occupied in specific rank.

Green, greyish-green to greyish white, caespitose perennial, 25–60 cm. high with intravaginal innovations (very rarely extravaginal or rhizome-forming). Culms very slender, more or less terete, 1- to 2-noded, closely scabrous-pubescent or puberulous below the nodes, otherwise sparsely puberulous or glabrescent. Upper sheaths rather densely, softly and shortly pubescent; lower sheaths not purplish. Ligule up to 1 mm. long, obtuse-truncate, ciliolate at the apex, scabrous and pubescent on the back. Blades fine and convolute, 8–30 cm. long, ca. 0·3–0·75 mm. in diameter with a very short keeled tip, densely scabrous-pubescent with very fine, rather stiff, more or less equal, very short hairs about 0·1 mm. (rarely up to 3 mm.) long, or densely scabrous with shorter asperities. Panicle somewhat loosely contracted or at length spreading, 5–15 cm. long, the branches filiform, simple and devoid of spikelets in the lower half to two-thirds, the lower 2- to 5-nate, the branches and pedicels all finely scabrous. Spikelets 3- to 5-flowered. Glumes rather short, moderately broad, rather thin, acute or subacute, very finely scabrous on the keels and sometimes on the sides upwards, the lower 1– to 3–nerved, the upper manifestly 3–nerved. Web present but rather sparse, or obsolete. Lemma 2·5–3·5 mm. long, lanceolate, usually loosely pubescent on the internerves with longer and denser hairs on the keel and at the base of the lateral nerves and margins. Palea rather finely scabrous on the keels upwards and usually ciliolate at and below the middle, loosely and finely pubescent on the back. Anthers ca. 1·5 mm. long. Plate XI, 8–11.

Tasmania: Archer (NSW 39132, 45676); A.H.S. Lucas (NSW 39602); George Town, Gunn 20.1.1843 (K); Penquite, Gunn No. 1491, 13.11.1841 (NSW 85554); Lisdillon, M.E. Phillips No. 597, 15.11.1960 (CBG 003048; NSW 52983); Gordon River, F.A. Rodway 11.1898 (NSW 39136); Mt. Nelson, W.M. Curtis 29.1.1947 (HO; K), and 1.7.1947 (HO; K); New Norfolk Mts., Gunn No. 596 in part, 11.12.1840 (NSW 39536, 39539, 45219, 45220); New Norfolk, Gunn No. 596 in part, 11.12.1840 (K); New Norfolk, Gunn No. 1468 (NSW 39772); Domain, Hobart, W.M. Curtis 16.12.1943 (HO; K); Hobart, L. Rodway 1.1930 and 11.1929 (HO); Hobart, A.H.S. Lucas 12.1923 (NSW 9073; K); The Domain, Hobart, S.T. Blake No. 18272, 14.1.1949 (BRI; NSW 57791); Domain, L. Rodway 11.1928 (K); Proctor's Road, Hobart, W.M. Curtis 17.12.1946 (HO; K); Blackmans Bay, O. Rodway 12.1939 (NSW 57792; K); Rocky Tom, Lindisfarne, R.A. Black 29.11.1924 (MEL); Huon Highway, ca. 10 miles S of Mt. Wellington, J. Vickery 19.1.1962 (NSW 57793, 57799); near Longley, ca. 1000 feet, M.E. Phillips & J. Vickery 19.1.1962 (NSW 57794; CBG 003100); Longley district, in open forest, J. Vickery 19.1.1962 (NSW 57796–57798); Longley, L. Rodway 1.1913 (HO); Huon Highway, S of Longley, M.E. Phillips & J. Vickery 19.1.1962 (NSW 57804; CBG 003185); near Margate, J. Vickery 21.1.1962 (NSW 57801); hills W of Margate, J. Vickery 21.1.1962 (NSW 57795); ca. 10 miles W of Copping, J. Vickery 15.1.1949 (NSW 39601); Copping, J. Vickery 15.1.1949 (NSW 39600).

The specimens from Longley, L. Rodway, and Rocky Tom, Lindisfarne, R.A. Black, cited above, have unusually long, dense hairs on the foliage giving the whole plant a whitish-grey appearance. This form deserves the further attention of collectors.

The following specimens from Victoria are morphologically very similar to *P. rodwayi* but I consider that further field study in this area, for which I have had no opportunity, is necessary to determine whether their affinities are more closely with *P. rodwayi* or *P. morrisii.*

Victoria: Austr. felix, (probably F. Mueller) (MEL); Ferntree Gully, railway line ½ mile E of Ringwood, T.B. Muir No. 2000, 11.12.1960 (MEL; NSW 85400); Mt. St. Leonard, ca. 2000 feet, M. Tindale 28.2.1966 (NSW 85409); Kilgobbin, Majorca, H. Bucknell (MEL); Melbourne, W.B. Guilfoyle 6.1879 (BRI); Port Phillip, Gunn No. 140, 1842 (K); Port Fairy, W.T. Whan (NSW 39075, 39609).

P. rodwayi is very closely related to *P. sieberana*, but appears to constitute a geographic race morphologically distinguishable by its very close, fine, scabrous asperities which are generally produced into very short hairs, on the laminae and usually also on the sheaths and culms. Except at the higher altitudes it appears to be the most abundant native species of *Poa* in Tasmania. Some of the most densely hairy specimens approach forms of *P. morrisii* but the closely convolute leaves usually serve to distinguish it.

36. P. induta *Vickery*, sp. nov.

Gramen perenne, griseo-viride, dense caespitosum, usque ad 90 cm. altum, innovationibus intravaginalibus. Culmi 1–2–nodi, modeste graciles subteretes vel plus minusve compressi, dense puberuli vel scabri vel sublaeves. Nodi puberuli. Vaginae superiores dense pilosae pilis mollibus usque ad 0·6 mm. longis saepe patentibus vel deflexis intermixtis pilis brevissimis rigidis, inferiores pallidae vel purpurascentes. Ligula membranacea vel chartacea, obtusa vel truncata, ad apicem minute ciliolata, ad dorsum puberula, ca 1 mm. longa. Laminae laxiuscule convolutae, 10–25 cm. longae, ca 0·7–0·8 mm. diametro, apicibus brevissimis, obliquis, carinatis, condensatis, paulo molles (haud rigidae), erectae vel paulo flexuoso-curvatae, pilis longiusculis patentibus et pilis brevissimis rigidiusculis dense vestitae vel raro pilis plus minusve obsolescentibus. Panicula tandem longe exserta, 4–18 cm. longa, saepe plus minusve contracta et secunda, plus minusve lanceolata vel tandem late pyramidalis ramis patentibus, ramis inaequalibus filiformibus infra medias sine spiculis, ramis ramulis pedicellisque scabris, ramis inferioribus 2–6–natis. Spiculae 2–7–flores, rhachillis aliquando plus minusve pubescentibus. Glumae acutae, modeste latae, ca. $\frac{2}{3}$–$\frac{5}{6}$ longitudinis lemmatis proximi, ad carinas scabrae et saepe ad nervos et facies laterales paulo scabrae, paulo inaequales, inferior 1–3–nervata, superior 3–nervata. Aranea macilenta vel obsolescens. Lemma 2·2–2·8 (raro –3) mm. longum, oblongo-lanceolatum, obtusum vel subacutum, ad dorsum in dimidio inferiore plus minusve uniformiter pubescens et saepe ad carinam et ad bases nervorum lateralis marginorumque pilis paulo longioribus. Palea ad carinas sursum scabra, deorsum ciliolata, ad dorsum pubescens. Antherae 1·3–1·5 mm. longae, flavescentes vel paulo purpurascentes. Caryopsis oblongum, ad dorsum valde convexum, contra sulcatum.

Holotype: New South Wales: Tooma Road above Tumut Pond, M.E. Phillips 3.2.1956 (NSW 39543).

Greyish-green, densely caespitose perennial up to 90 cm. high, the innovations intravaginal. Culms 1- to 2–noded, moderately slender, subterete or more or less compressed, closely puberulous or scabrid to subsmooth, the nodes also puberulous. Sheaths of the culm densely hairy with mingled soft, long (up to 0·6 mm.), often spreading or deflexed hairs and very short stiff hairs, the lower sheaths pallid or purplish. Ligule membranous to chartaceous, obtuse or truncate, minutely ciliolate at the apex, puberulous on the back, ca. 1 mm. long. Blades rather loosely inrolled, 10–25 cm. long and about 0·7–0·8 mm. diameter, with a very short, oblique, keeled, thickened tip, rather soft (not rigid), erect or slightly flexuose-curved, densely clothed with rather soft, long, spreading hairs and very short, rather stiff, scabrid hairs, rarely the hairs becoming more or less obsolescent. Panicle at length much exserted above the leaves on a long peduncle, 4–18 cm. long, often rather contracted and one-sided and more or less lanceolate in outline, or at length broadly pyramidal with loosely spreading branches, the lower branches 2- to 6-nate, unequal, filiform, devoid of spikelets below the middle, the branches, branchlets and pedicels scabrous. Spikelets 2- to 7–flowered, the rhachilla segments sometimes more or less pubescent. Glumes acute, about $\frac{2}{3}$–$\frac{5}{6}$ as long as the adjacent lemma, scabrous on the keel and often also slightly scabrous on the nerves and sides, slightly unequal, the lower 1- to 3–nerved, the upper 3–nerved, only moderately broad. Web rather sparse or obsolete. Lemma 2·2–2·8 (rarely –3) mm. long, oblong-lanceolate, obtuse or subacute, more or less uniformly pubescent on the back in the lower half with very slightly longer or denser hairs on the keel and at the base of the lateral nerves and margins. Palea scabrous on the keels above and ciliolate below on the lower two-thirds, pubescent on the back. Anthers ca. 1·3–1·5 mm. long, yellow or tinged with purple. Grain oblong, very convex on the back, furrowed in front. Plate XII. 6–8.

Central and Southern Tablelands of New South Wales, usually under eucalypt forest.

New South Wales: Near Hampton, near turn-off to Oberon from Jenolan road, in *Eucalyptus dalrympleana* forest, thick tussocks with soft leaves, J. Vickery 3.1.1955 (NSW 46125) and 30.1.1956 (NSW 46123, 46124); ca. 2 miles SW of Hampton on Oberon road, J. Vickery 26.1.1959 (NSW 57735); ca. 5 miles SW of Hampton on Oberon road, J. Vickery 26.1.1959 (NSW 57785); Norway, near Oberon, J. Vickery 3.1.1955 (NSW 39605, 39607); Boboyen road, ca. 3 miles S of Gudgenby River Crossing, ca. 4500 feet, high ridge through eucalypt woodland, R. Pullen No. 2563, 25.1.1961 (CANB; NSW 56537) and No. 2564, 25.1.1961 (CANB;

NSW 56538); saddle to S of Mt. Coree, Brindabella Range, ca. 3700 feet, tall eucalypt forest, R. Pullen No. 2535, 2536, 10.1.1961 (CANB; NSW 56532, 56531); Coree, ca. 20 miles W of Canberra on Brindabella Range, R.H. Cambage No. 3320, 10.12.1911 (SYD; NSW 39591; CANB); Five Fords on Canberra to Mt. Franklin road, J. Vickery 25.1.1964 (NSW 67693); Brindabella Range, ca. 3 miles S of Bulls Head, ca. 4000 feet, in eucalypt forest, R. Pullen No. 3025, 24.1.1962 (CANB; NSW 61206); 29 miles from Canberra on Mt. Gingera road in *Eucalyptus dalrympleana* forest, M. Tindale 16.1.1954 (NSW 46122); E side of Fishing Gap, Mt. Tidbinbilla, ca. 4000 feet, N.T. Burbidge No. 2776, 27.1.1948 (K) and No. 2777 (CANB; K; NSW 57778); Mt. Franklin road, in *Eucalyptus fastigata, E. dalrympleana* forest, N.T. Burbidge 23.3.1948 (CANB); Tumut River Valley, slope at T1 old track, in *Eucalyptus gigantea—E. robertsonii* forest, Mueller & Warren 20.1.1954 (NSW 39555); Tumut Pond dam site, ca. 10 miles SW of Kiandra, in forest, J. Vickery 20.1.1958 (NSW 44924, 45114); Cabramurra district, near T2 track, M.E. Phillips 1.2.1956 (NSW 39550); on the Kosciusko road above the Snowy Lookout, J. Vickery & M.E. Phillips 11.1.1956 (NSW 39596); Eucumbene Portal, Snowy Mts., forest community ca. 3700 feet, M.E. Phillips 27.1.1965 (CBG; NSW 82085, 82086); Kings Cross, ca. 8 miles WSW of Kiandra, on top of flat ridge, J. Vickery 20.1.1958 (NSW 44925); Junction Shaft Gauging Station, M.E. Phillips 5.1.1960 (NSW 50300); above Bundara Creek, Nimmo area, M.E. Phillips 2.12.1954 NSW 39592); Happy Jacks River gorge, near Junction Shaft, 4400 feet, I.G. Filmer 16.2.1957 (NSW 44923); Burns Creek, pilot track, M.E. Phillips 3.2.1956 (NSW 39553); Waterfall Creek, M.E. Phillips & J. Raeder-Roitzsch 10.1.1957 (NSW 39564, 44922); Island Bend, N.C. Beadle 4.2.1952 (SYD); cult. at Cooma from plant from Tower 26, Island Bend, M.E. Phillips 3.1956 (NSW 39588); Island Bend Camp, M.E. Phillips 30.11.1955 (NSW 39556); Island Bend, M.E. Phillips 7.12.1954 (NSW 39548, 39557, 39563, 39595); Pipers Creek, Kosciusko Plateau, M.E. Phillips 8.12.1954 (NSW 39594); Kosciusko area, Eight-Mile Camp track, M.E. Phillips 1.2.1956 (NSW 39551).

This species is closely related to *P. sieberana* but can generally be distinguished by the softer (more flexible) texture of the leaves and the pubescent sheaths and blades.

37. **P. petrophila** *Vickery*, **sp. nov.**

Gramen perenne, velutino-pubescens, aliquanto flavo-virides, dense caespitosum innovationibus intravaginalibus, plerumque 20–70 cm. altum. Culmi 1–2-nodi, pubescentes vel scabri, teretes, graciles. Nodi puberuli vel subglabri. Folia plerique basi. Vaginae tenuiter et dense pubescentes pilis patentibus vel deflexis, inferiores plus minusve purpurascentes tandem laxae. Ligula usque ad 3 mm. longa, truncata vel truncato-triangularis, ad apicem ciliolata, ad dorsum scabro-pubescens. Laminae involuto-teretes vel parce compressae, 5–25 cm. longae, plerique 0·5–0·7 mm. diam., aliquanto rigidae, tenuiter et dense pubescentes pilis brevibus rigidis patentibus plus minusve aequalibus. Pedunculus valde exsertus. Panicula 5–13 cm. longa, aliquanto contracta vel patens, ramis inferioribus 1–4-natis, plerumque in dimidio superiore ramosis et spiculas parce ferentibus, rhachidis ramis ramulis pedicellis arcte scabris vel scabro-pubescentibus. Spiculae 3–8-flores, purpurascentes vel stramineae vel viridescentes. Glumae ad carinas lateresque dense scabrae vel scabro-pubescentes, acutae vel subacutae vel plus minusve acuminatae, 3–nervatae, inaequales superiore quam inferiore longiore latioreque, ca. $\frac{3}{4}$–$\frac{5}{8}$ longitudinis lemmatis proximi. Aranea 0 vel pilis paucis. Lemma 3–4 mm. longum, late lanceolatum, deorsum ad dorsum ad internervos nervosque plus minusve dense pubescens vel scabro-pubescens vel scabrum (rarissime sublaeve), pilis ad carinam et deorsum basin versus nervorum lateralium marginariumque plerumque longioribus, sursum manifeste scabrum. Palea elliptica, ad dorsum scabro-pubescens, ad carinas scabro-ciliolata, deorsum pilis saepe parum brevioribus. Antherae 3, ca. 2 mm. longae.

Holotype: New South Wales: Barney's Creek, part headwaters of Happy Jacks River, ca. 16 miles S of Kiandra, on rocky outcrop of slate on steep hillside, J. Vickery 21.1.1958 (NSW 44276).

Velvety-pubescent, somewhat yellowish-green perennial, densely caespitose with intravaginal innovations arising in fascicles at the lower nodes, mostly 20–70 cm. high. Culms 1- to 2-noded, pubescent or scabrous, terete, slender. Nodes puberulous or subglabrous. Leaves mostly at the base. Sheaths finely and densely pubescent, the hairs spreading or deflexed, the lower sheaths more or less strongly tinted with purple, becoming loose. Ligule up to 3 mm. long, truncate or truncate-triangular, ciliolate at the apex, scabrous-pubescent on the back. Blades inrolled-terete or slightly compressed, mostly 5–25 cm. long, 0·5–0·7 mm. diam., somewhat rigid, finely and densely pubescent with short, stiff, spreading, more or less equal hairs. Peduncles much exserted. Panicles 5–13 cm. long, somewhat contracted or the lower branches somewhat spreading, the lower branches 1- to 4-nate, sparsely branched with the branches and spikelets mostly in the upper half, the rhachis, branches, branchlets and pedicels closely scabrous to scabrous-pubescent. Spikelets 3- to 8-flowered, purplish-tinted or straw-coloured or greenish. Glumes closely scabrous to scabrous-pubescent over the whole outer surface as well as on the keels, acute or subacute to more or less acuminate, 3-nerved, unequal with the upper longer and broader, about $\frac{3}{4}$–$\frac{5}{8}$ the length of the adjacent lemma. Web absent or reduced to a few hairs. Lemma 3–4 mm. long, broadly lanceolate, more or less densely pubescent, scabrous-pubescent or scabrous on the internerves and nerves (very rarely subsmooth) on the lower part of the back, the hairs usually longer on the keel and towards the base of the lateral nerves and margins, distinctly scabrous upwards. Palea elliptical, scabrous-pubescent on the back, scabrous-ciliolate on the keels with the hairs often slightly longer below. Anthers 3, about 2 mm. long. Plate XII, 4–5.

Occurs at elevations around 4,500 feet in the immediate vicinity of outcropping granite boulders in treeless "plains" or elsewhere on thin stony soils overlying rocky outcrops.

New South Wales: Happy Jacks Plain, headwaters of Happy Jacks River, ca. 15 miles S of Kiandra, yellowish-green tussocks amongst granite boulders on elevated hills in the treeless "plain", ca. 4800 feet, J. Vickery 18.1.1958 (NSW 44277, 44279) and 19.1.1958 (NSW 44278); Happy Jacks Plain, on rocky outcrops, M.E. Phillips 26.1.1965 (CBG); between Happy Jacks River and Happy Jacks road, a rigid, very hairy form occurring in rocky outcrops, M.E. Phillips & J. Raeder-Roitzsch 4.1.1957 (NSW 44281); cult. at Cooma from plant obtained from Happy Jacks road, M.E. Phillips 5.12.1957 (NSW 44280); junction of Wragge's and Piper's Creeks, Kosciusko Plateau, ca. 5200 feet, J. Vickery & M.E. Phillips 9.1.1956 (NSW 39545, 39546); above Piper's Creek tunnel, Kosciusko Plateau, M.E. Phillips 8.12.1954 (NSW 39549); above Piper's Creek, near Munyang, M.E. Phillips 8.12.1954 (NSW 39552); Piper's Creek, J. Vickery 28.1.1964 (NSW 67690).

This species resembles *P. induta* and some forms of *P. morrisii* but differs from both in the purplish lower sheath bases, the larger heavier-looking spikelets and in the hairs of the foliage being of virtually uniform length.

38. P. morrisii *Vickery*, sp. nov.

Gramen perenne, molliter pubescens, plerumque laxe caespitosum, griseo-viride, ca. 50–90 cm. altum, saepe innovationibus extravaginalibus, raro rhizomatibus, exigue basi condensatum. Culmi ca. 2–3-nodi, internodis inferioribus aliquando plus minusve compressis, superiores plus minusve teretes, nodis et internodis saltem infra nodos puberulis vel molliter et dense pubescentibus pilis usque ad 1 mm. longis. Vaginae striate, basi raro purpurascentes plerumque pallidae, pubescentes saepe dense pilis mollissimis tenuissimis ca. 0·5 mm. longis. Ligula 1–1·5 mm. longa, firma, truncata, ad apicem dense ciliolata, ad dorsum dense pubescens. Laminae explanatae et usque ad 3·5 mm. latae vel involutae et ca. 0·5–1·25 mm. diametro, usque ad 30 cm. longae, ad paginae exteriores dense (vel rare remote) pubescentes pilis usque ad 1 mm. longis vel breve hirsutae pilis ca. 0·25 mm. longis et inter pilis longiores saepe scabro-pubescentes, ad paginae interiores tenuiter denseque pubescentes. Panicula 9–25 cm. longa, aliquanto contracta vel tandem late patens, ramis inferioribus 1–3–natis in dimidio inferiore sine ramulis spiculisque, ramis ramulis pedicellisque scabris vel scabro-pubescentibus pilis plerumque 0·1–0·25 mm. longis. Spiculae 3–8–flores, oblongae vel ovatae. Glumae breviusculae, latiusculae, subacutae vel acutae, 3–nervatae, inaequales, ad carinas tenuiter et aliquanto molliter scabro-pubescentes, ad lateres laeves vel longe scabro-pubescentes, ad margines minute ciliolatae. Rhachillae aliquando pilis tenuibus araneosis dispersis. Aranea macilenta vel obsolescens. Lemma 2·2–4 mm. longum, lanceolatum, obtusum, plerumque ad internervos laxe pubescens, ad carinam nervos laterales marginesque pilis densioribus. Palea ad carinas sursum scabra, deorsum plerumque tenuiter longo-ciliolata vel raro in toto scabra, ad dorsum pubescens. Antherae ca. 1·8 mm. longae, flavescens vel parce purpurascens.

HOLOTYPE: VICTORIA: Sandringham, P. Morris 1934 (MEL; duplicate at K).

Softly hairy, usually loosely caespitose, greyish-green perennial, about 50–90 cm. high, with frequent extravaginal innovations, rarely with rhizomes, not markedly nodular-thickened at the base. Culms about 2– to 3–noded, the lower internodes sometimes more or less compressed, the upper more or less terete, with the internodes (at least below the nodes) and nodes puberulous to softly and densely pubescent with hairs up to about 1 mm. long. Sheaths pubescent (often densely) with soft fine hairs about 0·5 mm. long, striate, usually pallid, rarely purplish at the base. Ligule 1–1·5 mm. long, firm, truncate, densely ciliolate at the apex, densely pubescent on the back. Blades expanded and up to 3·5 mm. broad or loosely inrolled and about 0·5–1·25 mm. diameter, up to 30 cm. long, closely (or rarely only sparsely) pubescent with hairs up to 1 mm. long to shortly hirsute with hairs about 0·25 mm. long on the outer surface and sometimes scabrous-pubescent between the longer hairs, finely and densely pubescent on the inner surface. Panicle 9–25 cm. long, somewhat contracted or at length broadly spreading, the lower branches 1– to 3–nate, simple and devoid of spikelets in their lower half, the branches, branchlets and pedicels scabrous to scabrous-pubescent with hairs about 0·1–0·25 mm. long. Spikelets 3– to 8–flowered, oblong to ovate. Glumes rather short and rather broad, subacute or acute, 3–nerved, unequal, finely and rather softly scabrous-pubescent on the keels and smooth to long scabrous-pubescent on the sides, minutely ciliolate on the margins. Rhachillae sometimes with scattered, fine, web-like hairs. Web rather scanty or obsolete. Lemma 2·2–4 mm. long, lanceolate, obtuse, usually loosely hairy on the internerves with denser hairs on the keel, lateral nerves, and on the margins. Palea scabrous on the keels in the upper third, usually finely long-ciliolate in the lower two-thirds, or rarely scabrous throughout, pubescent on the back. Anthers about 1·8 mm. long, yellow or tinged with purple. Plate XII, 1–2.

VICTORIA: Gippsland, F.M. Campbell (BRI; K); S of Sassafras Gap, ca. 17 miles S of Nariel on Omeo road, J. Vickery 10.1.1959 (NSW 57850); Mt. Stanley, ca. 3300 feet, E.J. McBarron No. 2902, 3.1.1949 (EJMcB); Tatura, E. Gauba 30.10.1945 (CBG); Avenal, R.A. Black 1936 (MEL; K); Bright, sandy soil, banks of the Ovens River, W.V. Ludbrook 17.11.1940 (CANB); about 8 miles W of Lakes Entrance on the Mettung road, T.B. Muir No. 1980, 27.11.1960 (MEL; NSW 85401); northern end of Warby Ranges, T.B. Muir No. 173, 26.10.1957 (MEL; NSW 85408); Stawell, 3 Jacks Reserve, A.C. Beauglehole No. 22003, 17.11.1966 (NSW 85567); Grampian Mts., near Mackenzie Falls, J. Vickery 14.4.1961 (NSW 57852); Myrtlebank, Grampians, 1952 (ADW 9011); Castle Rock area, Victoria Range, Grampians, J.H. Willis & A.C. Beauglehole No. 16122, 11.12.1966 (NSW 85565); Black Range, 5½ miles NNE of Mt. Byron, W of the Grampians, ca. 1200 feet, sandstone rock ledges, J.H. Willis 2.3.1948 (MEL; K); about 2 miles NW of Mt. Byron trig., southern Black Range, western Grampians area, rock ledges of northern sandstone escarpment, J.H. Willis 2.11.1948 (MEL); 3 miles W of Yea, T.B. Muir No. 3555, 28.10.1964 (MEL; NSW 85385); Nhill, S. Dalton 12.1897 (NSW 39608); Dandenong Range, about half way down below Kalorama, L.S. Smith No. M10, 24.1.1943 (BRI);

Yarra Bank, Warrandyte, M.E. Phillips No. 364, 28.11.1961 (NSW 57851); Sassafras, Dandenong Ranges, ca. 1600 feet, P.R.H. St. John 1.1.1903 (MEL; K); western slopes of Mt. Dandenong, T.B. Muir Nos. 263, 265, 8.12.1957 (MEL; NSW 85406, 85407); Brighton, herb. A. Morrison 3.12.1892 (K); French Island, J.S. Ramsay 25.11.1904 (MEL); Shoreham, P. Morris 11.1932 (K); Shoreham 1934 (MEL); Little River, Fullagar (MEL); Ballarat, W.H. Bacchus (MEL); Brim Brim, Coleraine, M.E. Phillips 13.11.1958 (NSW 57867–57869); Darby River, Tongue Point Track, Wilsons Promontory, L.A.S. Johnson 13.1.1967 (NSW 45412); 7 miles E of Victoria-South Australia border, N side of Penola-Dergholm road, A.C. Beauglehole No. 6616, 9.11.1964 (NSW 85568).

SOUTH AUSTRALIA: Hundred of Joanna, A.C. Beauglehole No. 5725, 13.10.1963 (NSW 85586); Caroline Scrub, SE of Mt. Gambier, herb. J.M. Black 28.11.1917 (AD).

P. morrisii may be distinguished from *P. induta* and *P. petrophila* by its frequent production of extravaginal innovations and coarser foliage, from *P. crassicaudex* by its more hairy and velvety (to the touch) foliage and by the culms not being swollen at the base, from *P. mollis* by the more rigid foliage and the lower sheaths not being purplish at the base, and from *P. rodwayi* by its coarser and more robust habit and often expanded leaf-blades.

39. P. mollis *Vickery*, sp. nov.

Gramen perenne caespitosum molle, schistaceo- vel caesio-viride, 25–50 cm. altum, innovationibus intravaginalibus (?). Culmi 1–3–nodi, tenuiter sed dense breve-pubescentes praesertim infra nodos, infra paniculam glabrescentes, plus minusve teretes, graciles. Nodi breve pubescentes. Pedunculi in speciminibus visis folia solum breve excedenti. Vaginae densissime et molle tenuiter pubescentes, inferiores plerumque purpurascentes. Ligula 0·5–0·75 mm. longa, truncata, ad dorsum apicemque puberula. Laminae plicatae vel involutae, 12–20 cm. longae, explanatae 1–3 mm. latae, densissime tenuiter et molle scabro-pubescentes vel pubescentes pilis brevibus, tenues, nervis prominentibus sed plus minusve indumenta obscuratis, apicibus brevissimis carinatis. Panicula 8–15 cm. longa, ramis filiformibus, inferioribus usque ad 6–natis, ramis ramulis pedicellisque tenuissime scabris. Spiculae 3–4–flores. Glumae acutae vel acuminatae, ad carinas scabrociliatae, sursum ad latere minute scabrae, inferior 1–3–nervata, superiorque laterior et 3–nervata. Aranea 0. Rhachillae glabrae. Lemma 2·75–3 mm. longum, lanceolatum, plus minusve acutum vel obtusum, ad carinam marginesque pilis tenuibus, ad internervos subglabrum vel pilis paucis. Palea sursum ad carinas modeste longo-scabra, vel deorsum plus minusve ciliolata, ad dorsum (?) glabra.

HOLOTYPE: TASMANIA: Rocky cliffs at Cataract Gorge, S. Esk River, Launceston, W.M. Curtis No. 82, 27.10.1943 (K; HO).

Soft, downy, caespitose, greyish- or bluish-green, perennial, 25–50 cm. high, with intravaginal (?) innovations. Culms 1- to 3-noded, finely and densely short-pubescent especially below the nodes, more or less terete, slender, glabrescent below the panicle. Peduncles not greatly exceeding the leaves in the specimens seen. Nodes shortly pubescent. Sheaths very densely, softly and finely pubescent, the lower usually purplish. Ligule 0·5–0·75 mm. long, truncate, puberulous on the back and at the apex. Blades folded or involute, 1–3 mm. wide when flattened, 12–20 cm. long, very densely, finely and softly scabrous-pubescent or pubescent with short hairs, thin with prominent nerves somewhat masked by the indumentum, with very short keeled points. Panicle 8–15 cm. long, with filiform branches, the lower whorl up to 6–nate, the branches, branchlets and pedicels very finely scabrous. Spikelets 3- to 4-flowered. Glumes acute to acuminate, scabrous-ciliate on the keels and minutely scabrous on the sides upwards, the lower 1- to 3-nerved, the upper broader and 3-nerved. Web absent. Rhachillae glabrous. Lemma 2·75–3 mm. long, lanceolate in side view, more or less acute to very obtuse, with fine hairs on the keel and margins, subglabrous on the internerves or with a few very sparse hairs. Palea moderately long-scabrous on the keels in the upper three-quarters, glabrous (?) on the back. Plate XII, 3.

Tasmania: Cataract, Launceston 8.10.1887 (MEL); Launceston, The Gorge, W.M. Curtis No. 203 (K); Launceston, J.B. Cleland 11.1912 (NSW 39603); Cataract Gorge, Launceston, M.E. Phillips No. 707, 17.11.1960 (CBG 003045; NSW 52982); The Gorge, Launceston, E.J. McBarron No. 8493, 13.11.1963 (NSW 67046).

EXPERIMENTAL INTRODUCTIONS

P. arachnifera *Torr. in Marcy*, Expl. Red River (1853) 301. Figured in Hitchcock and Chase, Manual of the Grasses of the U.S. (1951) 107, and in many other references in American literature (see Index Londinensis).

Synonymy: For synonymy see Hitchcock & Chase, l.c., 937.

Perennial with creeping rhizome and tufted culms 30–75 cm. high, the blades 2–4 mm. wide, scabrous above. Panicle very compact, more or less lobed or interrupted. Plants dioecious; in the female panicles the lemmas are 5–6 mm. long, acuminate, copiously webbed at the base, the strongly compressed keel and lateral nerves densely ciliate-fringed along the lower half or more; in the male panicles the lemmas are glabrous with a scant web at the base or devoid of it. "Texas Blue Grass".

Native to North America. This species has been cultivated at the Royal Botanic Gardens, Sydney, and at various Agricultural Research Stations in New South Wales, and in Perth, but there is no evidence that it has become naturalised.

The figure by Breakwell in Agric. Gaz. N.S.W. XXIX (1918) 389 and in Grasses and Fodder Plants of N.S.W. (1923) 157 as to the panicle can scarcely represent this species, and as to the separate lemma only dubiously so.

P. nemoralis *L.*

This species was at one time grown experimentally at the Royal Botanic Gardens, Sydney, but does not appear to have become naturalised.

The grass illustrated by Breakwell in Agric. Gaz. N.S.W. XXIX (1918) 391 and in Grasses and Fodder Plants of N.S.W. (1923) 159 as "Canadian Blue Grass (*Poa compressa*)" is certainly not *P. compressa.* The specimen from which the drawing appears to have been made bears no indication of the locality or collector; it is *P. nemoralis* L.

P. nemoralis is a very slender tufted perennial with extravaginal shoots. It may be distinguished from *P. pratensis* by the absence of rhizomes (though very rarely it may root from the lowest nodes of the culms), very slender culms, thinner and more delicate leaf-blades, thinner and more delicate, narrower, usually long-acuminate and more evenly tapering glumes, narrower, more acute and more evenly tapering, thinner and more delicate lemmas, and absent or scanty web. For further description and illustration see Hubbard, Grasses (1954) 152–153. Widespread in Europe and Asia where a number of varieties and forms have been recognised, e.g. see Hegi, Illustrierte Flora von Mittel-Europa (1935) 414–416, or Jansen in Flora Neerlandica, Gramineae (1951) 85. For list of the numerous illustrations which have appeared see Index Londinensis. "Wood Poa".

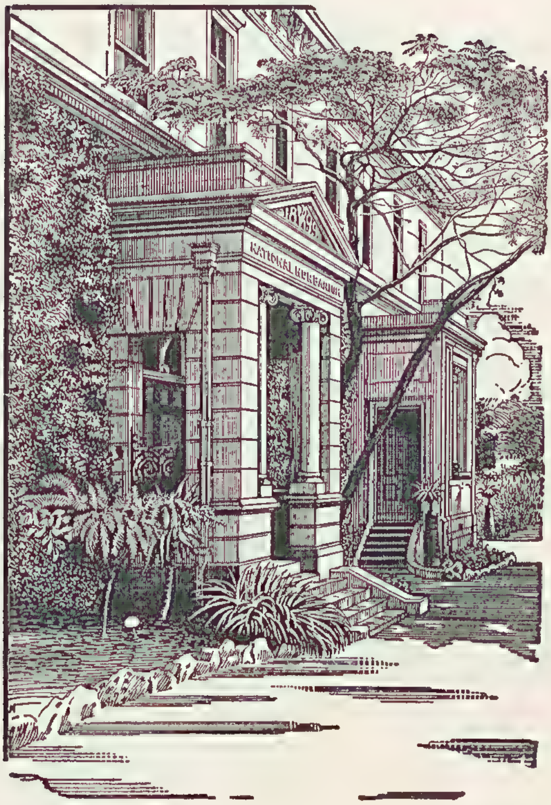
P. nevadensis *Vasey ex Scribn.*

A grass has been introduced and grown experimentally under the name *P. nevadensis* at the Agricultural Research Station, Bathurst, and at Hawkesbury Agricultural College in New South Wales. There is no evidence that it has become naturalised. I am as yet doubtful as to its true identity, since its ligule is rather short and obtuse instead of long as described for *P. nevadensis.* The grass is caespitose with leaves 1·5–3 mm. wide, spikelets rather narrow and longer than broad, web absent and lemmas glabrous and about 4–5 mm. long.

P. nevadensis, "Nevada Blue Grass", is native to North America.

NEW SOUTH WALES
DEPARTMENT OF AGRICULTURE

CONTRIBUTIONS
FROM THE
NEW SOUTH WALES NATIONAL HERBARIUM



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EDITOR: MARY D. TINDALE

Robert Henry Anderson (1899–1969)

Robert Henry Anderson (1899-1969)

Joyce W. Vickery

When Robert Henry Anderson, formerly Director of the Royal Botanic Gardens and National Herbarium, Sydney, died at his Chatswood home on 17th August, 1969, botanists and horticulturists not only of this institution but indeed of all the State lost a warm-hearted, kindly and lovable friend.

R.H. Anderson was born on 12th March, 1899, at Cooma, New South Wales, the son of a Presbyterian Minister, the Reverend William Addison Smyth Anderson and Jane (née Thompson). In 1923 he married Isabel Ellen Tyler who passed away in 1962. They are survived by one daughter Beverley Isabel, now Mrs Richard F. Passey of Armidale. In 1963 he married Phyllis Zena May Bell (née Goddard) who also survives him.

R.H. Anderson was educated at Fort Street High School and won an Exhibition for study at Sydney University. He graduated B.Sc.Agr. (Hons.) in 1921.

He enlisted in the AIF early in 1918 and his troopship was nearing Capetown when the Armistice was signed. The ship was ordered back to Australia, and he was demobilized in 1919.

He was appointed Botanical Assistant at the National Herbarium, Botanic Gardens (Department of Agriculture) on 4th January, 1921, and served in this institution continuously for 43 years. In 1925 his position was re-designated Assistant Botanist. Following upon the retirement of the former Curator, Edwin Cheel, he was promoted to the position of Botanist and Curator, National Herbarium of New South Wales, on 4th June, 1936, and re-designated Chief Botanist in 1939.

Since the early 1930's the position and title of Director had been abolished; the affairs of the Botanic Gardens had been administered by a superintendent, and those of the National Herbarium by a curator, though both administrations occupied the same building and shared the same office facilities and library.

The administrations were re-united when Mr Anderson was appointed Chief Botanist and Curator, Botanic Gardens and National Herbarium on 5th October, 1945. Later, in early 1960, he was granted the more appropriate title of Director, Royal Botanic Gardens and National Herbarium, and Chief Botanist.

He retired upon attaining the statutory age on 12th March, 1964.

As Director of the Royal Botanic Gardens, Mr Anderson also had the overall responsibility for the care of the Outer Domain, Centennial Park, and the grounds of Government House, Admiralty House and (since 1957) Kirribilli House. By personal inspection he concerned himself intimately with all the problems of maintenance, reorganization and reconstruction over these broad acres, and became known personally to each member of the large staff that he supervised.

He was convinced that open space and beautiful surroundings are of inestimable value to the people of a large city and determined that everything within his power should be done to preserve these amenities for them. In defence of their recreational rights he was obliged to wage almost unceasing battle against interests and instrumentalities which each saw in these apparently empty crown lands a site close to the heart of the city upon which its particular interests might be served and developed at low cost.

Not every battle was won. Political pressure and the sheer force of a rapidly expanding population, technology and the ubiquitous motor-car resulted in certain parts of the Gardens and Domain being alienated in turn for a car-park and for the Circular Quay roadway and Cahill Expressway, though threats from numerous other proposals were diverted. Defeated in these two major issues, Mr Anderson then devoted his thoughts and time to means whereby interference to and destruction in the Botanic Gardens and Domain could be kept to a minimum, and reconstruction brought about to best advantage. Innumerable consultations with public authorities and engineers made a heavy drain on his time and energies especially during the years 1956/62. In a later report he remarked sadly that the expressway was open for traffic in 1962 but the subsequent reconstruction was disappointingly slow.

Within the Botanic Garden itself he insisted that, while recreational values should be maintained, the scientific outlook should be kept in the forefront. He arranged for the plants under cultivation to be catalogued, unceasing attention given to their labelling with correct botanical names, and the living collections augmented with newly imported species obtained by exchange of seeds with comparable institutions in other countries.

He took a keen interest in the origins and history of the Royal Botanic Gardens, the second oldest botanic gardens in the southern hemisphere, and was proud of the fact that within its boundaries was the site of the first farm ever to be established in Australia. He arranged for this site, as nearly as it could be ascertained, to be commemorated by a plaque on a simple stone pedestal, as a reminder to all of the beginnings of colonization in this country. Much of his gleanings on the history of the Gardens is recorded in his whimsical essays in the *A. B. C. of the Royal Botanic Gardens.*

Following upon the visits of Her Majesty, Queen Elizabeth II and His Royal Highness the Duke of Edinburgh in 1954, and of the Queen Mother, Queen Elizabeth, in 1958, the Gardens were re-designated by Royal Authority as the Royal Botanic Gardens, Sydney, in recognition of their age, their continuous association with the development of New South Wales, and their high level of scientific achievement.

From early in his botanical career, Mr Anderson developed a particular interest in trees, as objects of beauty, as raw materials for innumerable uses and timber products, and as subjects worthy of scientific study. This interest resulted in his compiling the *Trees of New South Wales*, first published in 1932, and later in three revised editions. He was profoundly mindful of the fact that the urgent need for land for crops and pasture during early settlement had resulted in the wholesale and often thoughtless and wasteful destruction of the original forests, to an extent that many farms and holdings were deficient in shelter for their livestock, in necessary timber for farm use, and in the trees that could beautify and shelter their homes and, on the steeper slopes, protect their soils. He campaigned for the planting of trees in appropriate sites in country districts and urged that each farm should set aside an area for woodlots and shelterbelts as an integral part of farm economy. Even when administrative duties had forced him to surrender most of the strictly botanical work to his junior colleagues, he took a personal interest in supplying the necessary advice on trees suitable for planting in particular districts and for particular purposes in response to all enquiries. In 1925 he was appointed a part-time lecturer in forest botany in the Faculty of Agriculture, University of Sydney, and he carried out the duties of this office until the end of 1966.

By talks to agricultural and horticultural groups in city and country, by radio talks and television appearances, as well as by his response to so many written, telephone and personal enquiries, R.H. Anderson became well-known to a very wide circle, and his unfailing courtesy and kindliness won universal respect.

In 1953 he was a recipient of the Coronation Medal, awarded to distinguished citizens in commemoration of the coronation of Queen Elizabeth II.

While in his later years he was heavily occupied with administration, his earlier years had taught him the value of the scientific work of the National Herbarium, and of the need for ever-increasing knowledge of the Australian native flora and of the exotics which by deliberate intent or accident had reached these shores.

His own studies of the Chenopodiaceae considerably increased knowledge of the Australian representatives of this family, especially the genera *Atriplex* and *Bassia*; he described a new genus *Malacocera*. When in a position of authority he was at pains to select and build up a scientific staff with a genuine interest in botanical research and to provide the opportunities for their encouragement and scientific development.

He felt that a journal in which the results of the scientific work of its own staff could be published would do much to enhance the reputation of the institution and bring together significant papers which otherwise would have had to be scattered through numerous other journals. This resulted in the initiation of *Contributions from the New South Wales National Herbarium*, the first part of which appeared in August, 1939.

While a member of the Poison Plants Committee of the University of Sydney and the New South Wales Department of Agriculture, he provided many of the facilities for the work of its appointed officer to compile all available information on plants known to be or suspected of being poisonous to man or beast in New South Wales; upon completion of the work he personally took active steps to secure its publication (in 1942).

The preparation of a modern *Flora of New South Wales* was a project dear to his heart but difficult to achieve. Securing publication during the years of the second world war was no easy matter and through official sources virtually impossible. He secured the services in an honorary capacity of a well-known student of orchids, the Rev H.M.R. Rupp, recently retired from the Church of England Ministry, and encouraged him to record his knowledge in a form suitable for such a flora. While the project as a whole could not be set on its feet at that time, the outcome of Mr Rupp's work was published privately as *Orchids of New South Wales* in 1943 and regarded as the first instalment of a forthcoming flora. It was not until 1961 that, in slightly different format, publication was commenced of the flora he envisaged, and to which he supplied the introduction. Under his direction seven issues of the series, treating twenty-six families, appeared, and its production, slowly but steadily continuing under the present administration, will provide a suitable memorial to the man who inaugurated this major project.

While Director, Mr Anderson served ex officio on the Botanic Gardens Trust. He became a member of the Linnean Society of New South Wales in 1922 and served continuously on its council from 1936 onwards; he was president of the society 1940–41. He served continuously on the Muogamarra Sanctuary Trust from the time of its foundation until its functions were taken over by government, on the Remembrance Driveway Committee, the Horticultural Advisory Committee of the Department of Technical Education, the "Everglades" Committee of the National Trust, and the Standing Committee on Trees and Forests of the Men of the Land Society. He was president of the Geranium Section of the Royal Horticultural Society for many years. Other activities with which he was associated at various periods include the University of Sydney Agricultural Graduates' Association, the New South Wales Branch of the Australian Institute of Agricultural Science, the Wattle League and the Forestry League. In 1966 he was made an Honorary Fellow of the Australian and New Zealand Association for the Advancement of Science. In 1951 he was one of a party of scientists that visited the Kosciusko Plateau for a combined biological survey.

In 1969 he accepted the position of honorary secretary of the Linnean Society of New South Wales, in which capacity he was acting up to the time of his death.

He was gifted with a keen interest in human nature in its multifarious manifestations; his tolerance, kindliness and sympathetic understanding made him an approachable man with whom anyone might talk over their problems and receive wise counsel and enlightenment. With his irrepressible capacity to see the funny side of every situation, his cheerfulness and acute sense of humour enlivened many an occasion, and won the affection and friendship of his associates and a wide circle of citizens.

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A New Name for *Poa exilis* J. Vickery and a New Combination in *Brachiaria*

JOYCE W. VICKERY

SUMMARY

A new name *Poa meionectes* and a new combination *Br~~i~~achiaria fasciculata* var. *reticulata* are published.

Poa

In a recently published study of the genus *Poa* in Australia, I adopted the name *Poa exilis* for a species there described from south-eastern Australia.

Dr C.E. Hubbard of the Royal Botanic Gardens, Kew, has written and advised me that this name is pre-occupied by *Poa exilis* Murb~~u~~eck in Lunds Univ. Ärsskrift, n.f., Afd. 2, Bd. 1, No. 4 (1905) 73, which was based on *Poa annua* L. var. *exilis* Tommasini ex Freyn in Zool.-Bot. Gesellsch. Wien XXVII (1877) 469. This name has not been listed in Index Kewensis.

In Niles and Chase, Index to Grass Species (1962), the name is listed from a later date, viz. *Poa exilis* (Tomm.) Murb. ex Nannf., Symb. Bot. Upsal. 5 (1935) 11, based on the same variety. The taxon was treated as a subspecies, *Poa annua* subsp. *exilis* by Ascherson and Graebner in their Syn. Mitteleurop. Fl. 2, Abt. 1 (1900) 389–390, and by Murb~~u~~eck in Cuénod, Fl. Tunisie (1954) 129.

It is possible, but not certain, that *Poa exilis* Murb~~u~~eck may be pre-dated by Battandier and Trabut in their Flore Algérie et Tunisie (1905) 381, a work which Dr Hubbard informs me bears the date 1902 on the title page, 1904 on the wrapper, but according to the bibliographers was published early in 1905.

In any event the name clearly cannot be used for the Australian species which must be re-named as follows:

Poa meionectes *J. Vickery*, nom. nov.

BASIONYM: *Poa exilis* J. Vickery in Contrib. N.S.W. Nat. Herb. IV (1970) 212, non Murbuk (1905).

Brachiaria

S.T. Blake in Proc. Roy. Soc. Queensl. LXXXI (1969) 3–7, transferred to the genus *Brachiaria* a number of American species which had previously been known under *Panicum*. Of these he reported that *Brachiaria fasciculata*, *B. mutica* and *B. texana* now occur in Queensland. The same three species occur in New South Wales, but the first-named only in the form which had been known as a variety of *Panicum fasciculatum*, and this appears to require a new combination.

Brachiaria fasciculata (Sw.) S.T. Blake var. reticulata *J. Vickery*, comb. nov.

BASIONYM: *Panicum reticulatum* Torr. in Marcy, Expl. Red Riv. (1852) 299.

SYNONYM: *Panicum fasciculatum* var. *reticulatum* (Torr.) Beal, Grasses N. America II (1896) 117.

This variety is native to the southern United States and Mexico. In New South Wales it is now recorded from Gunnedah, the Quirindi Shire and Liverpool Plains Shire.

Lomandra glauca and some Related Taxa

ALMA T. LEE

SUMMARY

The new combination *Lomandra mucronata*, based on *Xerotes mucronata* R. Br., is published and its identity and distribution are clarified. *L. elongata*, *L. mucronata* and *L. glauca* (with three subspecies and including *L. collina*) are distinguished and described, the relationships in this group are briefly discussed, and a distribution map is provided.

Brown (1810) cited his species *Xerotes mucronata* as occurring in the Port Jackson district but Bentham (1878) corrected this, from the label on Brown's Type, to Lucky Bay, Western Australia, and suggested that Brown's rather imperfect specimen might be conspecific with *Acanthocarpus preissii.* Bentham also stated (p. 106) that Sieber's use of *Xerotes mucronata* on his Pl. Exs. 433 was a misdetermination of a specimen of *Lomandra glauca.* The epithet appears to have then been neglected until reference to its obscure identity was made nearly one hundred years later (Lee 1966, p. 42).

Later a photograph of Brown's Type was obtained from the British Museum of Natural History, with detailed information about the specimen, and not long afterwards Dr Barbara Briggs collected plants of the species in Western Australia. Brown had also described from Lucky Bay another species, *Xerotes collina,* which was obviously related to *L. glauca* and apparently to *L. mucronata.* Finally all the material appropriate to a review of the group was borrowed from the Western Australian Herbarium, the State Herbarium of South Australia and the National Herbarium of Victoria.

I now consider that the three epithets, *mucronata*, *glauca* and *collina* are properly applicable as follows: *mucronata* to a localised and distinct species in Western Australia, *glauca* to the eastern, and *collina* to the western, geographic race of an extensive and abundant species, *L. glauca,* which spreads right across the southern half of the continent. There is also a third, southeastern, race of *L. glauca,* previously unnamed, which occurs in Tasmania, western Victoria and southeastern South Australia; it is described below as ssp. *nana.* In addition, an apparently small population adjacent to the northeastern boundary of *L. glauca* is very close morphologically to that species and, with further collecting, may prove not to maintain its distinctness. It is at present recognised in specific rank as *L. elongata.*

As members of Bentham's Section *Cephalogyne* (of *Xerotes*), the three species under consideration, *L. glauca*, *L. elongata* and *L. mucronata*, all have male perianth segments joined in their lower halves and sessile female flowers in solitary, sessile or shortly pedunculate heads. Other species of Section *Cephalogyne* are:— *L. obliqua* (Thunb.) Macbride—largely sympatric with and clearly distinct from *L. glauca* ssp. *glauca* q.v. (though a very few specimens suggest that genetic isolation is incomplete), *L. suaveolens* (Endl.) Ewart, and *L. rupestris* (Endl.) Ewart—two apparently quite distinct species in Western Australia, and *Xerotes turbinata* Endl., placed in the Section by Bentham but now referred to the genus *Hensmania.*

Type specimens which are cited in the text have been examined, unless otherwise indicated.

Key to the Species

1. Membranous margin of the leaf-base lacerate into fibres (Figs. 1, a–c, Pl. XVIII, A and B) except sometimes in leaves below the inflorescence†, gradually narrowed (Fig. 1, b and c) at the top of its junction with the leaf, or if abruptly narrowed then lacerate early into fibres, (Fig. 1, a); leafy stems usually condensed, with shoots of about 5–15 mm diam. and erect to spreading leaves mostly over 5 cm and often over 10 cm long; leaf-apex truncate, obtuse, acute or acuminate (Fig. 1, f–h), at first always with a minute sharp point often eroded later.
    2. Male inflorescence branched, or if unbranched then usually at least half the height of the leaves or the leaves not more than 20 cm long and with truncate to obtuse apices; leaf-apex acuminate, acute, obtuse or truncate. New South Wales, Victoria, Tasmania, South Australia and Western Australia ...... *L. glauca* 1.
    2.* Male inflorescence unbranched, 5–8 cm long and usually much less than half the height of the elongate, erect leaves 30–40 (–70) cm long; leaf-apex acute to acuminate. Northeastern New South Wales in coast and tableland Divisions, and southeastern Queensland. (Pl. XX, C) .... *L. elongata* 2.

1.* Membranous margin of the leaf-base intact, and abruptly narrowed (Fig. 1, d and Pl. XVIII, C) at the top of its junction with the leaf; leafy stems usually extensive with slender shoots of about 5 mm diam. and short, often spreading leaves 2–4 cm long; leaf-apex sharply acuminate. Central part of south coast of Western Australia (Pl. XX, A and B) .... *L. mucronata* 3.

1. Lomandra glauca (*R. Br.*) *Ewart* in Proc. Roy. Soc. Vict. n.s. XXVIII (1916) 219.

BASIONYM: *Xerotes glauca* R. Br., Prodr. Fl. Nov. Holl. (1810) 260.

HOLOTYPE (♂): NEW SOUTH WALES: Iter Australiense, R. Brown 1802–5 (BM). Not seen; compared with a duplicate of a specimen known to me (NSW 50581, cited below under ssp. *glauca*) and reported to be a good match, by Mr A.S. George while he was Australian Botanical Liaison Officer at the Herbarium, Kew. Duplicates of NSW 17380, 18755 and 17953 (also cited under ssp. *glauca*) were similarly matched with an Isotype (K).

A detailed description of the species was given by Lee (1966) but the great majority of the specimens from which that description was derived belong to ssp. *glauca*, the significance of the infraspecific variation not being realized at that time. Of the specimens cited, the first and last are now known to have come from Victorian localities, and both belong to ssp. *collina* (see below). The distribution given there for the species applies to the whole population, and not only to ssp. *glauca*.

The species falls into three geographic races which are treated below as subspecies.

Key to the Subspecies

1. Leaf-apex truncate to acute with a small point soon eroding.
    2. Leaf-apex obtuse, acute or shortly acuminate (Fig. 1, f and g); membranous margins of the leaf-bases soon lacerate into fine white or pale fibres, rarely pinkish, all or at least those on leaves of sterile shoots abruptly narrowed at the top of their junction with the leaf (Fig. 1, a and Pl. XVIII, A). Peduncle of the branched or unbranched male inflorescence usually short and enclosed by the leaf bases (Pl. XIX, A). Leafy shoots with a tendency to elongate. New South Wales .... ssp. *glauca* a.

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† In general, leaves on fertile shoots, especially those close below an inflorescence, tend to retain their membranous margins in a more intact state and if these only are examined a false impression may be gained.

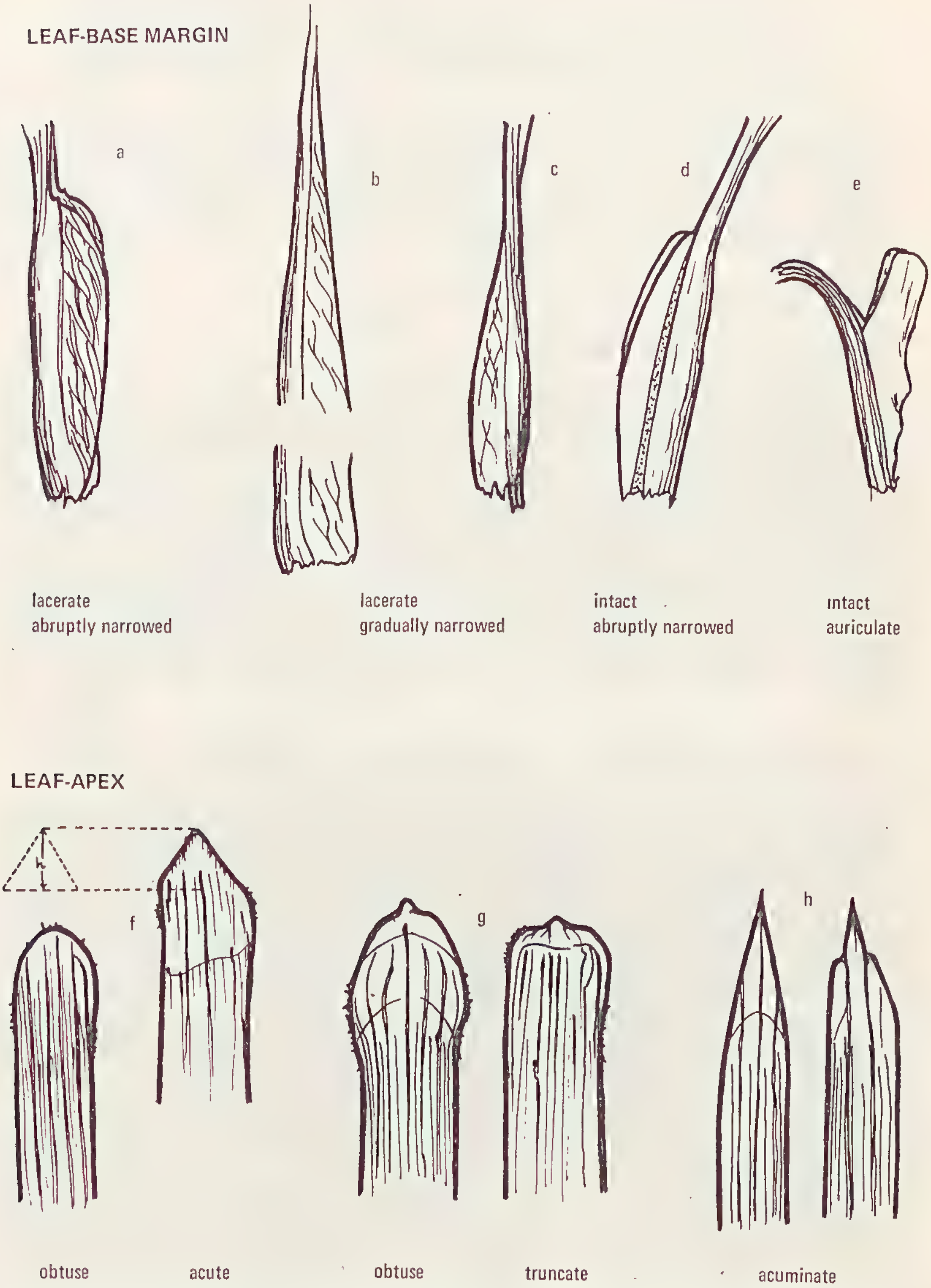

Fig. 1. Leaf-base margin: a. *Lomandra glauca* ssp. *glauca*. b. *L. glauca* ssp. *collina*. c. *L. glauca* ssp. *nana*. d. *L. mucronata*. e. *L. obliqua*. Leaf-apex: f. *L. glauca* ssp. *glauca*. g. *L. glauca* ssp. *nana*. h. *L. glauca* ssp. *collina*.

2.* Leaf-apex obtuse to truncate (Fig. 1, g); membranous margins of the leaf-bases not so finely nor so early lacerate, becoming brown with age; sterile shoots rarely seen in herbarium specimens and leaf-base margins usually narrowed gradually at the top (Fig. 1, c and Pl. XVIII, E). Peduncle of the unbranched male inflorescence often short but usually partly exposed above the leaf-bases. Leafy shoots usually much condensed and plants often small. Tasmania, Victoria and South Australia .... ssp. *nana* b.

1.* Leaf-apex acuminate or long-acute (Fig. 1, h); membranous margins of the leaf-bases early lacerate into fine fibres, pale or with some pinkish, orange or brownish colour; sterile shoots rarely seen and leaf-base margins usually narrowed gradually at the top (Fig. 1, b and Pl. XVIII, B). Male inflorescence usually branched and with some of the peduncle usually exposed above the leaf-bases. (Pl. XIX, B). Leafy shoots rarely elongating. Southern parts of Western Australia and South Australia, western New South Wales and western Victoria .... ssp. *collina* c.

a. ssp. glauca Pl. XIX, A.

BASIONYM and HOLOTYPE as for the species.

Usually small plants occasionally forming more or less sparse clumps, with leaves often glaucous (at least temporarily), erect or occasionally spreading, (4–) 8–20 (–45) cm long; leaf-apex obtuse to acute or shortly acuminate, the apical triangle (Fig. 1, f) seldom exceeding 1 mm high (0·25–) 0·5–1 (–2), and not toothed although more acuminate when young; membranous margins of the leaf-bases, at least on sterile shoots, narrowed abruptly at the top, and very early tearing into white, then pale, or rarely pinkish or dark brown, fine fibres (Fig. 1, a and Pl. XVIII, A); male inflorescence a panicle or less commonly an unbranched spike of clusters of flowers, its peduncle usually short and enclosed in the overlapping leaf-bases (Pl. XIX, A) or rarely longer and exposed for 1–2·5 cm; female inflorescence on a short peduncle exposed for 0–0·5 (–2·5) cm above the leaf-bases; leafy shoots with a tendency to elongate but often short, in herbarium specimens often 2–5 (–17) cm long.

DISTRIBUTION: NEW SOUTH WALES: southern part of the North Coast to South Coast, and Central and Southern Tablelands; occasional on the Central Slopes.

NEW SOUTH WALES: NORTH COAST: Nabiac, heathland, Gilbert 9.1947 (NSW 50556); Nabiac airstrip, Coveny 10.1967 (NSW 98239); Tea Gardens, Briggs 8.1964 (NSW 73924). CENTRAL COAST: Howes Valley to Putty, Johnson 9.1951 (NSW 17953); Island Mountain, N. of Colo R, Rodd 10.1964 (NSW 73923); Mitchell's Expedition of 1835, R. Cunningham (MEL 20943); 3 miles [4·8 km] NE. of Wisemans Ferry on road to Ten Mile Hollow, Briggs 8.1965 (NSW 96401), chromosome count voucher, $2n = 14$; Grose R, Woolls 1875 (MEL 20941); Valley Heights, Hamilton 1.1914 (NSW 50561); Springwood, Eames & Hotchkiss 10.1953 (NSW 50553); Milson Is., Hawkesbury R, Cleland (AD 95937003); Berowra, Boorman 10.1899 (NSW 50597); Berowra, Briggs 4.1964 (NSW 77890), chromosome count voucher, $2n = 28$; Berowra, Vickery 10.1936 (NSW 50599); Berowra, Salasoo No. 1408, 10.1955 (NSW 50591); 2 miles W. of Berowra, Briggs 4.1964 (NSW 69618), chromosome count voucher, $2n = 28$; Cowan, Blakely 9.1937 (NSW 50596) and 11.1927 (NSW 50585); Hornsby, Blakely 11.1914 (NSW 50600); Hornsby, Ford 10.1946 (NSW 50582); Spring Gully, Wahroonga, Salasoo Nos. 846 and 847, 9.1951 (NSW 50586); Pennant Hills, Fraser 9.1933 (NSW 50588); Palm Beach, Morris No. 1844, 9.1927 (NSW 50583); Palm Beach, Lee 10.1953 (NSW 50593), and 12.1954 (NSW 50589); Palm Beach isthmus, Goode No. 361, 9.1961 (NSW 57568; BM); Bilgola Heights Estate, Lee 10.1953 (NSW 50592); Narrabeen, Fletcher 10.1887 (NSW 57717); Mosman, Sydney, Kenny (BRI 000007); Mosman, Dixon 10.1904 (NSW 50590); Lindfield Reserve, White 10.1927 (BRI 000006); St. Leonards, Port Jackson district, Carron 6.1875 (NSW 50584*); North Shore, Sydney, Woolls (MEL 20953*); Parramatta, Woolls (MEL 20952) and Woolls 1871 (MEL 20935); Manly Point, Sydney, Toepffer No. 182, 12.1886 (MEL 20964); Port Jackson, Woolls (MEL 20955* and 20956); South Head, near Sydney, Cleland 9.1910 (AD 95937002); Watsons Bay, Roberts 1886 (MEL 20970*); sandhills near Double Bay, 11.1893

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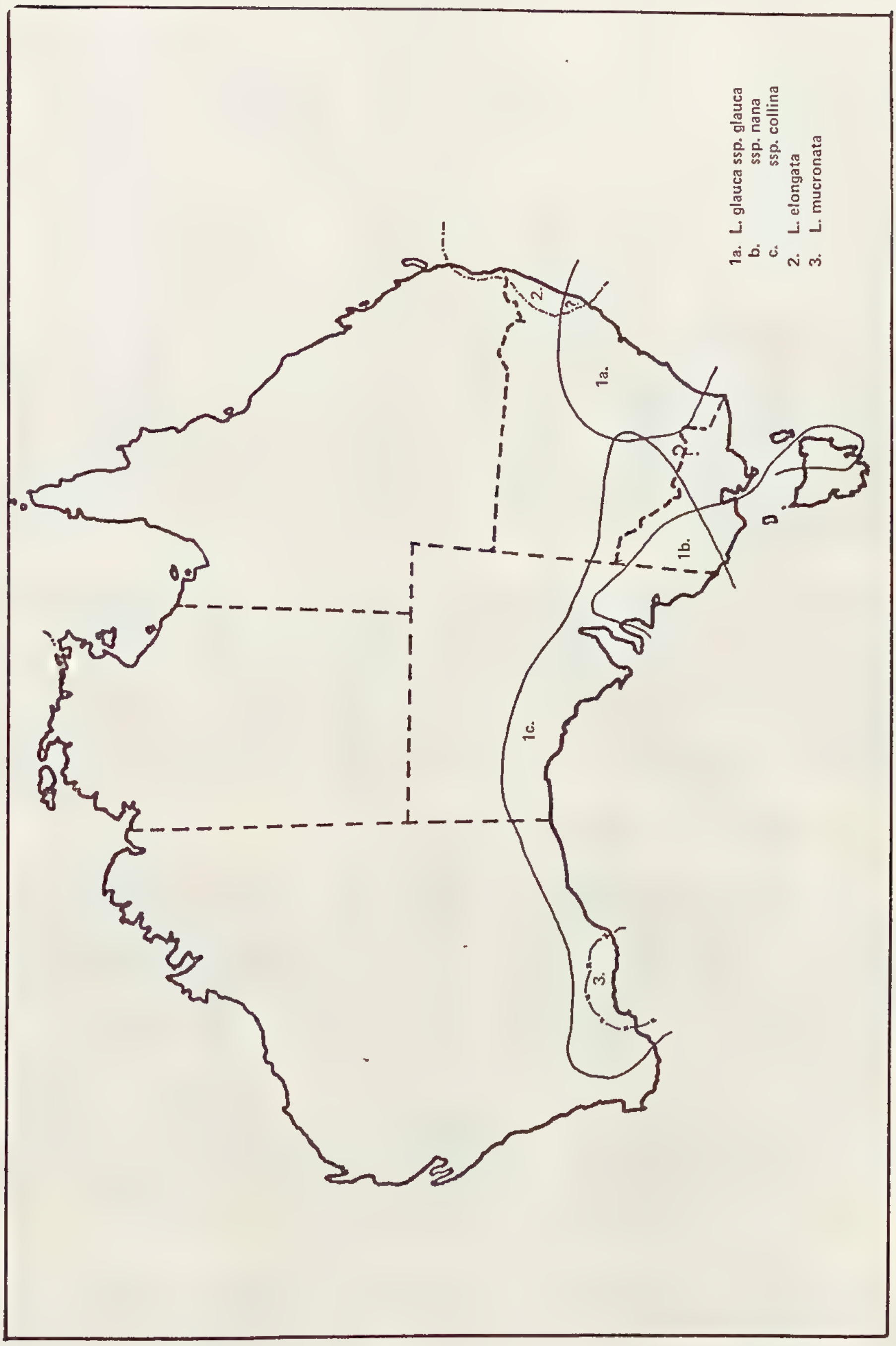
* morphologically approaching *L. obliqua*.



Map 1. Map of Australia showing areas of occurrence of *Lomandra glauca*, *L. elongata* and *L. mucronata*.

(NSW 50601); Sydney, Scott (MEL 20948); Centennial Park, Cheel 11.1898 (NSW 50595); Waverley, Camfield 11.1898 (NSW 50598); Port Jackson district, Helms 10.1902 (BRI 000002); South Coogee, Mair 10.1954 (NSW 50580) and 11.1955 (NSW 50581; AD); Botany Bay district, Camfield 1893 (NSW 50594); near Port Hacking R, National Park, Salasoo No. 1614, 7.1958 (NSW 50587); Woronora Dam, S. of Waterfall, Constable 8.1956 (NSW 45234). SOUTH COAST: Jervis Bay, Maiden 7.1899 (NSW 50558); Jervis Bay, Rodway 9.1928 (NSW 50647); Pt Perpendicular, Constable 10.1960 (NSW 52296); Yatteyattah-Lake Conjola Road, McBarron No. 13013, 9.1966 (NSW 85303); Twofold Bay, Mueller 1860 (MEL 10957); Twofold Bay, 9.1860 (MEL 20934). CENTRAL TABLELANDS: 2 miles E. of Currant Mountain Gap, 7 miles [11·3 km] E. of Olinda, Johnson 9.1951 (NSW 49812); Bell-Lithgow road, Garden 11.1952 (NSW 50562); Blue Mountains, Betche 10.1881 (NSW 50557); Blue Mountains, Woolls (MEL 20932); Mt Victoria, Hamilton 1.1915 (NSW 50563); Hat Hill Creek, Blackheath, Constable 11.1953 (NSW 26472); Medlow-Blackheath, Hamilton 11.1914 (NSW 50559); Leura, Hamilton 11.1914 (NSW 50560); Wentworth Falls, near top of the falls, Briggs 6.1964 (NSW 69620), chromosome count voucher, $2n = 28$; Kings Tableland 3 miles [4·8 km] S. of Wentworth Falls, Constable 10.1960 (NSW 53621); Woodford, Constable 10.1950 (NSW 18812); Burragorang to Wentworth Falls, Maiden 10.1898 (NSW 49694); W. end of Mt Solitary, 5 miles [8·1 km] S. of Katoomba, Constable 11.1960 (NSW 54021); Crafts Wall, Kanangra, 10 miles [16·1 km] SE. of Jenolan Caves, Constable No. 5853, 5.1965 (NSW 77231); Yerranderie, Cambage No. 2299, 10.1909 (NSW 50566); Hilltop, Shirley (BRI 000005). SOUTHERN TABLELANDS: sandstone plateau c. 4 miles [6·4 km] NE. of Nerriga, Craven No. 648, 10.1965 (NSW 81635); Mt Budawang c. 10 miles [16·1 km] ESE. of Braidwood, Craven No. 656, 11.1965 (NSW 81633); summit of Mt Budawang, Craven No. 654, 11.1965 (NSW 81634); head of Tuross R, Kybean, Cambage No. 2007, 11.1908 (NSW 50565). CENTRAL WESTERN SLOPES: Goonoo State Forest, Dubbo-Mendooran, Chippendale & Constable 9.1951 (NSW 17380); Hunter Valley, Story No. 6666, 9.1959 (NSW 50564); Lees Pinch, Wollar-Merriwa road, Johnson 9.1951 (NSW 18755); Bumberry, Cleland 10.1916 (AD 95937001); also: E. Extratrop. Austr., Sieber No. 433 "N.Holl". "*X. mucronata*" (MEL 20959).

Occasional plants are found which approach *L. obliqua* in aspect, having extensive leafy stems and spreading leaves, and sometimes in the membranous margins of the leaf-bases being almost auriculate at the top (cf. Fig. 1, e). Chromosome counts (Briggs unpubl. and in Lee, 1966) of $2n = 28$ and $2n = 14$ have been found in *L. glauca* ssp. *glauca* wheras $2n = 14$ obtains in *L. obliqua*, but the voucher for $2n = 14$ in *L. glauca* is not morphologically like *L. obliqua*. Specimens showing morphological resemblances to *L. obliqua* are marked * in the citations above.

b. **ssp. nana** *A. Lee*, **ssp. nov.** Plate XIX, C.

A ssp. *glauca* et ssp. *collina* in foliis fere planis, caesio-viridibus, vix glaucis, in apice obtusiore etiam truncato, in spicis indivisis florum conglobatorum (quae non nunquam in ssp. *glauca* videntur), in grossiore laceratione marginum foliorum basium differt; praeterea a ssp. *glauca* in pedunculis plerumque super foliorum bases expositis et in marginibus foliorum basium membranaceis qui in verticem gradatim angustiores fiunt, et a ssp. *collina* in brevibus et latioribus foliis distincta est.

Differs from ssp. *glauca* and *collina* in its usually flat, somewhat bluish-green leaves, scarcely glaucous, its more obtuse and even truncate leaf-apex, its undivided spikes of flower clusters (sometimes seen also in ssp. *glauca*) and in the coarser laceration of its leaf-base margins. From ssp. *glauca* it is further distinguished by its peduncles usually exposed above the leaf-bases, and by the membranous margins of the bases gradually narrowed at the top, and from ssp. *collina* by its short and relatively broader leaves.

Usually small and sometimes very small plants often less than 10 cm high and with a bluish-green tint in the leaves at least when newly dried; leaves erect, or curved to one side (perhaps pathological), (3–) 5–15 (–20) cm long, the apex obtuse to truncate or occasionally shortly acute, with a minute point sometimes persisting, and the apical triangle (0·2–) 0·3–0·8 (–1·5) mm high, not toothed when young (Fig. 1, g); membranous margins of the leaf-bases lacerate but often into narrow strips rather than fine fibres, or sometimes intact if the shoots are all fertile (Fig. 1, c and Pl. XVIII E); margins gradually narrowed upwards, usually white at first, often dark brown when old; male inflorescence a spike of clusters, unbranched except in a few specimens regarded as approaching ssp. *collina*, its peduncle usually partly exposed for (0·2–) 0·5–1 (–2·5) cm; female peduncle not or very shortly (0·5 cm) exposed (Pl. XIX, c); leafy shoots usually very condensed, 0·2–1 (–3) cm long.

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* morphologically approaching *L. obliqua*.

Holotype: Victoria: Wimmera district, C. Walter No. 9, 10.1900 (NSW 50575).

Distribution: Tasmania, Western Victoria and southeastern South Australia. In Lee (1966) the records of *L. glauca* for Victoria and South Australia were partly, and for Tasmania wholly, based on specimens of this subspecies.

South Australia: Southern Districts: Sevenhill, Black 11.1925 (AD 95935036) c. 1·5 km E. of Truro, Kraehenbuehl No. 684, 9.1962 (AD); Angaston, Cleland 2.1925 (AD 95803007); Bethania, Gawler R, F. Mueller 1848 (MEL 20945); rifle ranges c. 2 km W. of Bethany, Eichler No. 16403, 9.1959 (AD); between Kersbrook and Williamstown c. 6·5 km N. of Kersbrook, Eichler No. 17107, 12.1960 (AD); Torrens Gorge, Tepper 9.1892 (AD 95940007—on sheet with specimen of ssp. *collina*); Blue Gum Scrub S. of Highbury Hotel, Kraehenbuehl No. 830, 10.1962 (AD); Cherryville, Ising 11.1921 (AD 95940098); Stonyfell Hill, Cleland 11.1940 (AD 95803001); Eagle-on-Hill, Cleland 10.1942 (AD 95935044); Upper Waterfall Gully, Cleland 11.1942 (AD 95802184, 95940021) and 11.1942 (AD 95935042); National Park, Cleland 10.1930 (AD 95802191), 11.1938 (AD 95803012), 12.1939 (AD 95802192); and 10.1935 (AD 95935046), 11.1938 (AD 95935045), 12.1939 (AD 95934047); Aldgate, Menzel 11.1896 (AD 95936076); Aldgate, Maiden 1.1907 (NSW 50577); Coromandel Valley, Tepper 11.1881 (AD 95936059); Mylor, Cleland 11.1922 (AD 95802195); Clarendon, Tepper 10.1882 (MEL 20969); and 12.1881 (AD 95939015); near Mt Compass, Cleland 1.1947 (AD 95802190); Square Waterhole near Mt Compass, Cleland 1.1941 (AD 95802198); Myponga, Cleland 10.1938 (AD 95935040); Myponga, Cleland 10.1939 (AD 95802171); Port Elliot, Eichler No. 15028, 10.1958 (AD); Port Elliot, Cleland 9.1955 (AD 95802185); Port Elliot, Cleland 12.1954 (AD 95803038); Encounter Bay, Cleland 1.1924 (AD 95802194). Murray Lands: Finniss, Ising 2.1926 (AD 95940049); scrub S. of Western Flat E. of Bordertown road, Hunt No. 352, 11.1961 (AD). Southeast: Hundred of Joanna, scrub 10 km SE. of Naracoorte, Hunt No. 252, 10.1961 (AD); scrub, Hundred of Robertson, c. 10 km S. of Naracoorte, Hunt No. 244, 11.1961 (AD); Mt Burr Forest Reserve c. 12 km E. of Millicent, Wilson No. 1107, 11.1959 (AD).

Victoria: Maryvale (Wimmera), Macpherson 1898 (MEL 20915); Mt Arapiles, Little Desert, Henshall 9.1967 (NSW 113953); head of Muchong Creek, between Cherry Pool on upper Glenelg R and eastern foot of Black Range, Willis 3.1948 (MEL 20650).

Tasmania: Launceston, Hannaford 11.1863 (MEL 20947); Launceston, Simson No. 1677, 10.1879 (MEL 20926); Launceston, Oakden 1886 (MEL 20963); "Penquite" [near Launceston] herb. Gunn No. 93, 11–12.1845 and $\frac{93}{1832}$, 12.1845 (NSW 50579); near Perth, Archer No. 96, "December" (NSW 50578); South Esk near Perth, ? Archer, No. 124, "December 10th" (MEL 20946); South Esk, C. St[uart] 1848 (MEL 20951); Pontville, herb. Spicer No. 61 (MEL 20924).

The following specimens have the general aspect, chiefly from leaf characters, of ssp. *nana*, but approach ssp. *collina* (below) in having a more or less branched male inflorescence often with more abundant flowers in the clusters:—

South Australia: Fiedler's Section (Adelaide), Behr (MEL 20950).

Victoria: near Dimboola, 23 (MEL 20913); Shire of Dimboola, Reader 10.1893 (MEL 20912); Wimmera, Dallachy 9.1860 (MEL 20914); base of Humbug Hill, Creswick, Willis 11.1930 (MEL 20649); near Botanic Museum, Melbourne, Minchin 1.1890 (MEL 20907).

c. **ssp. collina** (*R.Br.*) *A. Lee*, **comb. et stat. nov.** Pl. XIX, B.

Basionym: *Xerotes collina* R. Br., Prodr. Fl. Nov. Holl. (1810) 260.

HOLOTYPE (♀): WESTERN AUSTRALIA: EYRE: (assumed from Bentham, Fl. Austral. VII (1878) 107): Lucky Bay, R. Brown (BM). Not seen; compared with duplicates of a male specimen examined by me (NSW 84793, cited below), and reported to be a good match in vegetative characters by A.S. George. Mr George also stated that the specimen on the right-hand side of the Type sheet of *X. collina* "appears to be *Xerotes mucronata*".

ABSOLUTE SYNONYM: *Lomandra collina* (R. Br.) Ewart in Proc. Roy. Soc. Vict. XXVIII (1916) 220.

EQUIVALENT SYNONYM: *Xerotes glauca* R. Br. var. *occidentalis* Benth., Fl. Austral. VII (1878) 106.

SYNTYPES: WESTERN AUSTRALIA: EYRE: Cape Paisley, Maxwell (MEL 20901) and Esperance Bay, Maxwell (MEL 20902). Judging by his determinations on specimens in the National Herbarium, Melbourne, Willis (1962) is referring to the present subspecies when describing populations on mallee sandhills in northwestern Victoria as "doubtless referable to *Xerotes glauca* R. Br. var. *occidentalis* Benth.".

Usually taller plants than in the other subspecies, tufted and with distinctly glaucous leaves and condensed stems; leaves erect, (3–) 10–25 (–50) cm long or even more, the apex long-acute to acuminate, its apical triangle (1–) 2–2·5 (–5·5) mm high, with 2 or 3 minute irregular teeth when very young (Fig. 1, h); membranous margins of the leaf-bases gradually narrowed upwards, at first white or pale and, at least in sterile shoots, early lacerate into fine fibres (Fig. 1, b and Pl. XVIII, B); junction of leaf-base and membranous margin not infrequently with a pinkish to orange-brown coloured stripe seen chiefly in older parts of the shoot; male inflorescence usually branched—a panicle of clusters, its peduncle usually exposed above the overlapping leaf-bases for (0–) 1–3 (–5) cm; female peduncle exposed for (0–) 0·5–2 (–3) cm (Pl. XIX, B); leafy shoots condensed, in herbarium specimens often about 2–5 cm long.

DISTRIBUTION: southern part of Western and South Australia, western Victoria and western New South Wales.

WESTERN AUSTRALIA: AVON: Kellerberrin, Fitzgerald 11.1907 (NSW 102446). STIRLING: Bremer R, Webb 1884 (MEL 20939); Bremer Bay, Gardner 10.1942 (PERTH); near King Georges Sound, Maxwell (MEL 20931). EYRE: Level poor plains inland N. from Cape Paisley, [Maxwell] (MEL 20901)—a syntype of *Xerotes glauca* var. *occidentalis* Benth.; Circle Valley-Red Lake, Davies No. 93, 12.1962 (PERTH); Israelite Bay, Brooke 1883 (MEL 20940); *Melaleuca* flats, Esperance Bay, Maxwell (MEL 20966); Esperance Bay, Maxwell "*Melaleuca* flats" (MEL 20902)—the two preceding specimens are syntypes of *Xerotes glauca* var. *occidentalis* Benth.; Esperance, Andrews "2nd coll. 296", 10.1903 (PERTH); Pink Lake, Esperance, Cleland 9.1950 (AD 96144002). COOLGARDIE: W. of Salmon Gums, Brockway No. 16, 10.1944 (PERTH); ½ mile [0·8 km] S. of Salmon Gums on Esperance road, Briggs Nos. 301a and 301b, 9.1966 (NSW 84793); near the W. extremity of the Great Bight, Carey 1877 (MEL 20930); EUCLA: NE. Nullabor Plain, Carey 1877 (MEL 20936); Eucla, Carey 1877 (MEL 20919). Without specific locality: Drummond No. 315 (MEL 20618); Drummond No. 116 (NSW 114036; MEL 20619).

SOUTH AUSTRALIA: GREAT AUSTRALIAN BIGHT TO EYRE PENINSULA: between Eucla and Fowler's Bay, Richards (MEL 20922); 60 miles N. of Pt Bell, Richards 8.1880 (AD 95936062); 60 miles [96·6 km] N. of Pt Bell, Richards 8.1880 (MEL 20937); Ceduna, Caulfield No. 163, 9.1955 (AD); Coorabie, Cleland 10.1953 (AD 95803031); Koonibba, Cleland 8.1928 (AD 95803004); Gawler Ranges, Sullivan (MEL 20933); Gawler Range, Ising No. 3412, 9.1938 (AD); Gawler Range (south), Ising and Johns 11.1939 (AD 95940014); Gawler Range W. of Port Augusta, Johns 9.1938 (AD 95940016); 12 miles [19·3 km] N. of Minnipa, Ising 9.1938 (AD 95940054); Minnipa, Ising 9.1938 (AD 95942012); Minnipa, Osborn No. 522 (AD); ± 8 miles NW. of Port Kenny, Eyre Peninsula, Willis 9.1963 (MEL 20648); Whyalla—Kimba road c. 74 km W. of Whyalla sandhills, Wilson No. 181, 10.1958 (AD; NSW 50573); Venus Bay, Warburton (MEL 20944); Darke Peak c. 40 km SW. of Kimba, Ising 8.1935 (AD 95940051); Hambidge Flora and Fauna Reserve, Alcock No. 1017, 9.1966 (AD); Flora and Fauna Reserve . . . c. 85 km N. of Port Lincoln, Specht No. 2597, 11.1960 (AD); Arno Bay, Ising 8.1935 (AD 95940087); Boston Point, Wilson No. 392, 10.1958 (AD; NSW 50572); Mt Dutton 48·3 km (30 miles) N. of Port Lincoln, Cleland 6.1913 (AD 95802196); Port Lincoln, Kirton Point, Wilson No. 416, 10.1958 (AD); Port Lincoln, Browne No. C 35, 1875 (MEL 20923); Port Lincoln, 9.1927 (AD 95939006); Port Lincoln, Brown 1873 (MEL 20949). YORKE PENINSULA:

Moonta, Beythien No. 80, 1888 (MEL 20965); 4 miles from Moonta towards Maitland, Phillips No. 020929, 10.1965 (AD); between Arthurton and Maitland, Smith No. 784, 10.1967 (AD); Ardrossan, Yorke Peninsula, Tepper No. 343, 1879 (MEL 20962); Ardrossan, Tepper 9.1879 (AD 95939014); Yorke Peninsula, Tepper No. 343, 1879 (MEL 20954, 20938); Hundred of Curramulka, SE. Yorke Peninsula, Blaylock No. 250, 10.1966 (AD); Corny Point c. 3 km SE. of the Lighthouse, Eichler No. 14126, 9.1957 (AD; NSW 50570); sea coast c. 4 km S. of Corny Point, Eichler No. 14055, 9.1957 (AD); c. 8 km SSW. of Corny Point Lighthouse, Blaylock No. 341, 10.1966 (AD). Southern Districts: c. 1 km N. of Tanunda, Kraehenbuehl No. 1650, 10.1966 (AD); Tanunda, Kraehenbuehl No. 435, 9.1962 (AD); Sandy Creek Scrub, 7 km E. of Gawler, Tepper 10.1888 (AD 95940010); Outer Harbour, Kraehenbuehl No. 511, 10.1961 (AD); Outer Harbour, Cleland 10.1932 (AD 95803017 and 95935037); Outer Harbour, Fagg 8.1965 (AD 96535190); Osborne, Ising 1.1925 (AD 95942001); Largs Bay, NW. of Adelaide, Ising 1.1931 (AD 95940083); Grange Sandhills, Cleland 11.1926 (AD 95803002); sandhills near Grange, Cleland 10.1927 (AD 95935034), 95935033); Grange in sandhills, Cleland 10.1927 (AD 95803015 and 95803016); Grange in sandhills, Cleland 10.1928 (AD 95803020, –1, –2); Grange (on sandhills), Cleland 10.1928 (AD 95940022 and 95940023); pinery, near Grange, Field Naturalists 9.1942 (AD 95936089); pinery, Port R, Cleland 10.1932 (AD 95803014); Henley Beach, Menzel 10.1897 (AD 95936077); Marino [c. 15 km SSW. of Adelaide], Cleland 9.1953 (AD 95802200); near Newlands Head beyond Encounter Bay, Cleland 2.1921 (AD 95803018). Murray Lands: Monash, c. 5 km NW. of Berri, Cleland 8.1946 (AD 95940020 and AD 95802199); Berri, Black 10.1921 (AD 95935050); Karoonda, Cleland 8.1924 (AD 95803019); Monarto South, Cleland 5.1925 (AD 95803013); Monarto South, Ising 9.1917 (AD 95940100); Monarto South, Ising No. 1122, 8.1919 (AD); Chaunceys Line near Monarto South, Sharrad No. 121, 9.1959 (AD); Chaunceys Line, 8 km SSE. of Hartley, Eichler No. 12375, 4.1956 (AD; NSW 50571); Chaunceys Line near Hartley, Cleland 10.1838 (AD 95802197 and 95935039); Chaunceys Line—Monarto South, Eichler No. 15032, 10.1958 (AD; NSW 50569), and Eichler No. 15033, (AD); Chaunceys Line c. 20 km SW. of Murray Bridge, Sharrad No. 118, 9.1959 (AD); Chaunceys Line c. 20 km SW. of Murray Bridge, Cleland 9.1962 (AD 96546063); Goolwa, Cleland 1.1940 (AD 95803009 and 95803043; and 12.1940 (AD 95803010); c. 70 km N. of Bordertown off the Pinnaroo-Bordertown road, Wilson No. 2104, 8.1961 (AD); 30 miles [c. 50 km] S. of Pinnaroo on Bordertown road, Sharrad Nos. 1115 and 1116, 8.1961 (AD); 53 km S. of Pinnaroo, Donner No. 267, 8.1961 (AD); western part of Archibald Makin Reserve . . . , [c. 48 km NNW. of Bordertown], Kraehenbuehl No. 1070, 10.1963 (AD); 4 miles N. of Malinong Hall, Sharrad No. 862, 10.1960 (AD); Malinong c. 50 km SSE. of Murray Bridge, Sharrad No. 115, 9.1959 (AD); 3 miles [4·8. km] E. of Malinong, Sharrad No. 1004, 8.1961 (AD); E. of Wellington, Black 11.1906 (AD 95935049); scrub E. of Wellington, Tate "Oct. 2" (AD 95936060); Lameroo, c. 115 km ESE. of Murray Bridge, Black 10.1918 (AD 95935038); 2 miles [3·2 km] E. of Coomandook, Sharrad No. 899, 10.1960 (AD); c. 24 km NE. of Keith, Wilson No. 1954, 8.1961 (AD) and No. 1953, 8.1961 (AD); Reserve 14 miles [22·5 km] E. of Keith, Cleland 1.1960 (AD 96021147); Dark Island heath, 9 miles [14·5 km] NE. of Keith, Specht and Rayson No. 9, 10.1950 (AD); Wirrega, c. 25 km NW. of Bordertown, Osborn 10.1916 (AD 95936086). Southeast: in hills not far from Rivoli Bay, Dr. M[ueller] 8.1848 (MEL 20929); between Mt Gambier and Rivoli Bay, F. M[ueller] 1848 (MEL 20967).

Victoria: Mt Murchison, D[allachy] (MEL 20971; NSW 50568*); Murray R, Dallachy (MEL 20972; NSW 50567*); 4 miles SE. of Red Cliffs, Willis 9.1940 (MEL 20903, 20904); Kulkyne, Murray R, 8.1858 (MEL 20973); Big Desert 8 miles [12·9 km] E. of S.A. border and 22 miles, [35·4 km] N. of Western Highway, Aston No. 1023, 9.1963 (MEL 32638); Big Desert, ± 9 miles N. of Serviceton, Willis 9.1948 (MEL 20647); Kiata, NW. Vic., D'Alton No. 4A (MEL 20905); Dimboola, D'Alton 9.1899 (MEL 20910); near border of Victoria, Walter 10.1888 (MEL 20908); Wimmera district, Walter 10.1900 (NSW 102445); mallee near Dimboola, Reader No. 5, 9.1894 (MEL 20906); Little Desert, Lowan, Reader 10.1897 (MEL 20974, 20975); Lower Glenelg R, Eckert No. 92, 1891 (MEL 20981).

New South Wales: Western Plains: Rankins Springs, Althofer 9.1966 (NSW 95546); 17 miles N. of Barellan, Edwards 9.1969 (NSW 113504); Leeton Hills, about 8 miles N of Leeton, Edwards 8.1969 (NSW 113506); 44 miles [70·8 km] NW. of Balranald, Mulham 10.1970 (NSW 114017).

2. L. **elongata** (*Benth.*) *Ewart* in Proc. Roy. Soc. Vict. XXVIII (1916) 219. Pl. XX, C.

Basionym: *Xerotes elongata* Benth., Fl. Austral. II (1878) 106 as to lectotype (see Lee, 1962).

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* These two specimens, which are syntypes of *Xerotes elongata* Benth. but not conspecific with its lectotype, were cited as *L. glauca* by Lee (1966), mistaking Dallachy's "Mt Murchison" on the Murray R for that near Wilcannia in north-western New South Wales.

LECTOTYPE: QUEENSLAND: MORETON: Moreton Island in sandy soil, Ferd. Mueller 8.1855 (MEL). LECTOPARATYPES: NEW SOUTH WALES: NORTHERN TABLELANDS: New England, Timbarra, C. St[uart] (MEL); New England (Poverty Point), C. St[uart] 701, "Oct." (MEL; NSW 50555). Two other specimens cited by Bentham are syntypes of the basionym not conspecific with the lectotype but belonging to *L. glauca* ssp. *collina*, viz. "Mt Murchison" (Mr Jamieson's station of this name on the Murray R, where Dallachy is known to have collected in 1858 is most probably the source of this specimen), Dallachy (MEL; NSW 50568) and Murray R, Dallachy (MEL; NSW 50567). The syntype from Lake Bonney (not seen) is also probably *L. glauca* ssp. *collina*, judging from its locality.

Plants similar in habit to *L. glauca* ssp. *collina* i.e. with condensed stems and longer leaves than in other subspecies of *L. glauca* but with only a slight or temporary glaucous aspect (Pl. XX, C); leaves erect, (10–) 30–40 (–70) cm long, gradually tapered towards the apex but with a more or less distinct apical triangle only 0·5–1·5 mm high, not toothed when young; membranous margins of the leaf-bases abruptly narrowed upwards in the few sterile shoots examined (but obscure because most of the shoots are fertile), white to pale, then usually with some pinkish, orange or tan colour either in a stripe along the junction of leaf-base and margin or suffused through one or both of these parts, early lacerate into more or less fine fibres but again not obviously so as most of the shoots seen are fertile and leaf-base margins thus less torn; male inflorescence unbranched—a spike of clusters 5–8 cm long, with the peduncle exposed for about 1 (0·5–1·8) cm above the leaf-bases, the female peduncle exposed for 2–3 cm; leafy shoots condensed, 2–4 cm long.

DISTRIBUTION: Northern Tablelands and North Coast of New South Wales, and south-eastern corner of Queensland.

QUEENSLAND: WIDE BAY, extreme S. of: Noosa Heads, Harrold 8.1967 (NSW 85309) and 9.1967 (NSW 98633).

NEW SOUTH WALES: NORTH COAST: N. of the Bald Knob, Angourie, McGillivray No. 2148, 6.1966 (NSW 94825). NORTHERN TABLELANDS: Poverty Point, New England, C. Stuart No. 701, "October" (NSW 50555); c. 6 miles [9·7 km] SW. of Ebor, Lee 11.1968 (NSW 102498); Armidale-Grafton, Floyd 10.1959 (NSW 50830).

3. L. mucronata (*R. Br.*) *A. Lee*, comb. nov. Pl. XX, A.

BASIONYM: *Xerotes mucronata* R. Br., Prodr. Fl. Nov. Holl. (1810) 260.

HOLOTYPE: WESTERN AUSTRALIA: EYRE: South Coast of Nuyts Land, Bay I [now Lucky Bay], R. Brown 1.1802 (BM). Photograph only seen: specimen matched with duplicates of specimens known to me (NSW 84796♀ and 96068♂, cited below) by A.S. George.

Glaucous, cushion-forming plants with numerous relatively extensive leafy shoots bearing short, spreading to erect leaves (1–) 2·5–3·5 (–5) cm long; leaf-apex acuminate, the finely pointed apical triangle 1·3–2·5 mm high, not toothed when young (Pl. XX, B); membranous margins of the leaf-bases intact and somewhat firmer than in the other species, abruptly narrowed upwards in the sterile shoots and, even on the fertile shoots, less gradually than in the other species, white at first then pale to golden brown, soon developing pale but distinct reddish to brown markings along the junction with the leaf base (Fig. 1, d and Pl. XVIII, C); male inflorescence a small spike or panicle of clusters of flowers, the peduncle rarely exposed above the leaf bases and then for only about 5 mm; female peduncle not exposed in the few specimens seen; leafy shoots slender, extensive relative to the length of the leaves, up to 15 cm long.

DISTRIBUTION: south of Western Australia in the area bounded approximately by Norseman, Bremer Bay and Esperance.

WESTERN AUSTRALIA: EYRE: Grass Patch to Gibson near 531 mile peg, Briggs No. 316, 9.1966 (♂ NSW 96068) and 317 (♀ NSW 84796); 22 miles [35·4 km] from Hopetoun towards Ravensthorpe, Wrigley 10.1969 (CBG; NSW 113650); Mt Boyatup, E. of Esperance, Aplin No. 2609, 10.1963 (PERTH); Cape Le Grand, Wilson No. 5556, 10.1966 (PERTH); Cape Le Grand, Briggs No. 397, 9.1966 (NSW 84795); Duke of Orleans Bay, 40 miles [64·4 km] E. of Esperance, Willis 11.1950 (MEL 20646); Lucky Bay, R. Brown 1.1802 (BM, photograph only seen); breakaways at Qualup, Blackall 10.1928 (PERTH); c. 30 km N. of Bremer Bay, Wilson No. 4387, 10.1966 (PERTH).

ACKNOWLEDGEMENTS

My thanks are due to Mr John Lewis of the British Museum of Natural History for his continued efforts to match the Type of *Xerotes mucronata* with other species known to me, and for detailed information on the characters of that Type; these attempts, though unsuccessful at the time, made it easy to recognize this species when it was collected. I also wish to thank the Officer-in-Charge of the Western Australian Herbarium; the Keeper, State Herbarium of South Australia; the Director, National Herbarium of Victoria and their staffs for the preparation and loan of considerable collections for this investigation. I am also indebted to Associate Professor J.J. Nicholls of the University of Sydney for the Latin description, to Dr Joyce Vickery for advice in preparation of the manuscript, to Miss Angela Claussen for the line drawings in the text, and to Mrs D. Lyon and Mr W.K. Gamble for the photographs.

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A Nomenclatural Tour (*Ixora queenslandica* Fosberg)

D.J. McGillivray

SUMMARY

The nomenclatural history of *Ixora queenslandica* Fosberg is outlined. It is concluded that the name is legitimate and correct. A lectotype is selected for *Ixora triflora* Benth. and *Diplospora ixoroides* F. Muell.

INTRODUCTION

During a study of the Australian collections made by Banks and Solander (see Contrib. N.S.W. Nat. Herb. IV (1970) 112–125) I encountered some nomenclatural problems relating to *Ixora triflora* Benth., *Diplospora ixoroides* F. Muell. and *Ixora queenslandica* Fosberg. This note is published as a guide to assist others who, in future, may have to take this nomenclatural tour in the course of taxonomic work.

Ixora triflora—*Application of the name before publication*

In May 1770 Banks and Solander made collections at Thirsty Sound in the Bay of Inlets (on mainland opposite Long Island, Broad Sound, Queensland). An *Ixora* in flower was one of their discoveries, and from their collections of it, Parkinson prepared a sketch while Solander drafted a description which appeared under the name "*Pavetta triflora*", in his manuscript florula of New Holland. Some years later James Miller, under the direction of Solander, produced a completed illustration of a flowering branch with the aid of Parkinson's accurate sketch and the specimens in Banks' herbarium.

Robert Brown visited Thirsty Sound in September 1802 and made a further collection of the species which at that time was in fruit only. After returning to England, Brown prepared a manuscript description of the plant under the name "*Ixora triflora*", with details of corolline structure transferred, after slight changes, from Solander's manuscript (in Bank's library). Brown labelled the Banks and Solander collection—"*Ixora triflora*".

Publication of the name **Ixora triflora**

Seemann made the combination *Ixora triflora* (Forst. f.) Seem. in his Fl. Vitiensis (April 1866) 133, for another species of *Ixora* collected at Tahiti by Forster and originally described as *Coffea triflora* Forst. f. in his Prodr. (1786) 16. Fosberg suggested that the plant may have been collected at Huahine, Society Islands (Bernice P. Bishop Occas. Papers XIII (1937) 266).

Nine months later Bentham, Fl. Austral. III (January 1867) 416, described "*Ixora triflora* R. Br. Herb." and cited the following specimens: East Coast, R. Brown; Broad Sound, Bowman; Rockhampton, Thozet; Rockhampton, Dallachy. In a note following the description Bentham remarked:— "Very unlike any other *Ixora* known to me, but the ovules and the aestivation of the corolla are those of the genus". None of the specimens cited by Bentham was the "*I. triflora*" of Robert Brown. The specimen "East Coast, R. Brown" is at the British Museum, but it bears no Brownian script, only "Rubiacea East Coast" noted by Dryander, and Bentham's annotation "Ixora ? triflora R. Br." This specimen in addition to all the other syntypes at the Herbarium at Kew, and the National Herbarium of Victoria, Melbourne, belong to a species of *Diplospora* and are quite distinct from the plant called "*Ixora triflora*" by Brown. I am grateful to Mr J.H. Willis for advice on the identity of the syntypes at the National Herbarium of Victoria.

The narrative is here broken to nominate a lectotype for *I. triflora* Benth. It might be pointed out that the use of Robert Brown's name in the author citation is unnecessary and misleading.

LECTOTYPE: Rockhampton, (Queensland), Dallachy (K, isolectotype MEL). The lectotype is annotated by Bentham.

The publication of **Diplospora ixoroides** *F. Muell.*

F. Mueller, Fragm. IX (1875) 182, realized the correct generic position of Bentham's species and transferred it to *Diplospora,* but provided it with a new epithet, believing the epithet "*triflora*" to be inept. Fortunately Bentham's name was not only inept but also illegitimate as a later homonym, and *Diplospora ixoroides* F. Muell. was therefore a legitimate new name based on *I. triflora* Benth. (lectotypified above).

Until 1901 the name *D. ixoroides* was correctly applied, and there was no further discovery of Brown's "*Ixora triflora*" to disturb this. In May 1901 the second part of "Illustrations of the Botany of Captain Cook's Voyage" by James Britten was issued. It included as Plate 141 a print of Brown's "*Ixora triflora*" engraved from James Miller's illustration, and, in the accompanying text on page 45, Solander's manuscript description of "*Pavetta triflora*" appeared under the name *Diplospora ixoroides* F. Muell., with "*Ixora triflora* R. Br. ex Benth." in synonymy. F.M. Bailey in his Comprehensive Catalogue of Queensland Plants (1913) 241, 243 t. 217 accepted Britten's interpretation, and it was not until C.T. White sent critical notes and specimens to Spencer Moore at the British Museum (Natural History) that Britten's misconception was "corrected". In a "Note on *Ixora triflora* R. Br.", J. Bot., LXIV (1926) 215 Moore indicated that:—
[my subdivisions]

(i) Brown's and Solander's manuscript descriptions applied to "a typical *Ixora*";

(ii) that Bentham's description applied to "quite a different plant . . . *Diplospora ixoroides*".

(iii) . . ."*Ixora triflora* is well represented in James Miller's drawing on tab. 141 of Illustrations of Australian Plants, and this proves Solander's description of the corolla to be correct".

In (iii) Moore effectively and validly published the name *Ixora triflora* R. Br. ex S. Moore nom. illeg. [non (Forst. f.) Seem., nec Benth.] typified by the Banks and Solander specimen collected at Bay of Inlets, May 1770 (BM). Although the specimen lacks flowers, Solander had prepared his manuscript description (published by Britten in May 1901) from the collection which provided a flowering branch for Parkinson to illustrate, and herbarium material for Banks. But still the *Ixora* was without a legitimate name.

The publication of **Ixora queenslandica** *Fosberg*

While working on the Rubiaceae belonging to the Pacific zone Dr F.R. Fosberg discovered that the name *Ixora triflora* (Forst. f.) Seem. predated *I. triflora* Benth. and also realized that this Australian species of *Ixora* was still without a legitimate name. Fosberg mistakenly believed that part of the type material of *Ixora triflora* Benth. ("East Coast, R. Brown") was of the true *Ixora*, and proposed *Ixora queenslandica* nom. nov. with *I. triflora* R. Br. in Benth. (in part) as the replaced synonym (J. Bot. LXXVI (1938) 234). It could be reasonably assumed that the culmination of the discussion and other non-formal parts of his paper is the formal presentation of the new name and its replaced synonym. Thus it appears that a superfluous name for *Diplospora ixoroides* F. Muell. has been produced. Certainly the new name could not be accepted as legitimate—or could it? It is perfectly clear that a legitimate name for Brown's "*I. triflora*" was intended, and, if possible, it would be desirable to avoid the publication of another new name. In the paragraph preceding the citation of specimens Fosberg refers to S. Moore's paper in J.Bot. LXIV (1926) 215 [as 216] as a source of information of the colour of the flowers and shape of the fruit, but in so doing gives "a reference to a previously and effectively published Latin description. . . ." (I.C.N.B. Article 36) viz., Moore's citation on p. 215 of that portion of Brown's description which Brown transposed, in a slightly modified form, from Solander's manuscript. (N.B.; this is not the description validating *I. triflora* R. Br. ex S. Moore). All the requirements of valid publication are fulfilled provided that one is prepared to accept the name as a "sp. nov." instead of a "nom. nov.". The name *Ixora queenslandica* Fosberg is typified by the specimen:— Bay of Inlets, Banks and Solander, May 1770 (BM, holotype).

Those who are disinclined to agree with this conclusion may find the alternative equally unacceptable.

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This study was made during my term as Australian Botanical Liaison Officer, and I am grateful to the Keeper, the Herbarium, Kew, and the Keeper of Botany, British Museum (Natural History) for the opportunities to examine specimens and manuscripts. I also wish to thank several of my colleagues especially Dr R.K. Brummitt, Mr P.S. Green and Mr R.D. Meikle, of the Herbarium, Kew, for stimulating discussions on nomenclatural matters. I am especially grateful to Dr F.R. Fosberg who read the manuscript and suggested several improvements which have been incorporated.

Thysanotus virgatus sp. nov. (Liliaceae) from Royal National Park, New South Wales

N.H. Brittan*

SUMMARY

A new species *Thysanotus virgatus* N.H. Brittan is described and illustrated. It appears to have affinities with *T. juncifolius* (Salisb.) Willis et Court, and with a new species from South Australia, *T. fractiflexus* N.H. Brittan.

This new species, so far known only from two localities in New South Wales, is closely related to *T. juncifolius* (Salisb.) Willis et Court. It occurs within the distributional range of the latter species but appears from the limited information available to have different ecological preferences—most obviously *T. juncifolius* on Hawkesbury sandstone and *T. virgatus* on lateritic outcrops and gravels. The new species in its ridged, densely shortly hairy stems and markedly broader outer tepals, 3–4 mm wide, typically 7– (occasionally 6–) nerved, differs from *T. juncifolius* with its glabrous stems (hirsute only in the lowest parts) and 5-nerved outer tepals 1·5–2 mm wide. *T. virgatus* is probably more closely related to a new species *T. fractiflexus* N.H. Brittan (Brittan 1971) from Kangaroo Island, South Australia, with which it has in common the ridged hirsute stems, but which has a distinctive zig-zag mode of branching associated with short internodes. The outer tepals of *T. fractiflexus* are also narrower, 2–2·5 mm wide—and usually 5-nerved.

Thysanotus virgatus *N.H. Brittan*, **sp. nov.**

Herba perennis, aphylla videtur. Rhizoma plus minusve horizontale, circa 3 cm longum, 8–10 mm diam. Radices fasciculatae, fibrosae, haud tuberosae. Caules numerosi, 28–30 cm longi, porcati, porcis dense brevissime hirsutis. Ramificatio caulium varians, monopodialis-dichotoma, interdum ad nodos 2–3 ramosis. Bracteae in nodos infimos 1·5 cm longae, sursum deminuentes, in nodos summos 4 mm longae. Umbellae terminales, plerumque 2-florae, 2 bracteis membranaceo-marginatis 2–2·5 mm longis inclusae. Bracteae interiorae membranaceae, late-ovatae, 2 mm longae, 1-2 nervatis fuscis. Pedicelli 6–8 mm longi, erecti, e basi 2 mm articulati. Flores ut in genus. Tepala exteriora 10–11 mm longa, 3–4 mm lata, lineari-elliptica, mucronata, extus 6–7 nervata, marginibus anguste membranaceis, tepala interiora elliptica, 5–6 mm lata, fimbriata, fimbriis 4–5 mm longis. Stamina 6; antherae atropurpureae, 3 exteriores rectae, tortae, 3 mm longae; 3 interiores curvatae, tortae, 6 mm longae; filamentis circa 2·5 mm longis. Ovarium sessile, globulare, triloculare, utroque loculo ovulis 2. Stylus terminalis, strictus, erectus, 5 mm longus. Capsula ab perianthio persistenti inclusa, 5–6 mm longa, circa 3 mm diam.

HOLOTYPUS:—Bottle Forest Rd., Heathcote, N.S.W., N.H. Brittan 59/106—1 (NSW).

ISOTYPI:—Ibid.—59/106—lb (K), 59/106—lc (MEL). Pl. XXI.

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Perennial herb, apparently leafless, rhizome more or less horizontal, ca 3 cm long, 8–10 mm diam. *Roots* clustered, fibrous, without tubers. *Stems* several, 28–30 cm tall, ridged, very shortly densely hirsute on the ridges. 2–3 sterile nodes towards the base of the stem; bracts acute, 1·5 cm long below to 4 mm in upper regions. *Branching* sometimes almost dichotomous, other times monopodial, occasionally 2–3 branches at one node, lower branches usually branched again. *Umbels* terminal at ends of branches, usually two-flowered, enclosed by two bracts 2–2·5 mm long, acute, membranous-edged. *Flowering bracts* 2 mm long, membranous, broadly ovate, 1–2 dark veins. *Pedicels* 6–8 mm, erect in flower and fruit, articulated at level of bract apices. *Flowers* as in genus. *Outer tepals* 10–11 mm long, 3–4 mm wide, linear-elliptical, 6–7 nerved on the outside, mucronate, with narrow membranous margins; inner tepals elliptical, 5–6 mm wide, fringed, the fimbriae 4–5 mm long. *Stamens* 6; anthers dark purple, 3 outer anthers straight, twisted, 3 mm long; 3 inner anthers curved, twisted, 6 mm long; filaments ca 2·5 mm long. *Ovary* sessile, globular, trilocular, 2 ovules per loculus. *Style* terminal, straight, erect, 5 mm long. *Capsule* enclosed by persistent perianth parts, 5–6 mm long, ca 3 mm diam.

HABITAT: In *Eucalyptus-Banksia* forest in lateritic soil.

SPECIMENS EXAMINED:—Holotype locality, Brittan 53/28, 23.1.1954 (UWA) and Brittan 61/02, 3.6.1961 (UWA); near gravel pit, Royal National Park, N.S.W. Brittan 61/03 (Anatomical material only—UWA).

ACKNOWLEDGEMENTS

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A New Species of *Acacia* from the Northern Territory

Mary D. Tindale* and J. R. Maconochie†

SUMMARY

A new Australian species of *Acacia* (Family Mimosaceae) from the Mongrel Downs district of the Northern Territory is described. This is a member of the Juliflorae Falcatae‡.

Acacia crassifrugis *Tindale et Maconochie*, sp. nov.

Frutex vel arbor parva 3–4 m alta, ramulis phyllodiisque pendulis; cortice trunci sulcato duro persistenti griseo-nigro; ramulis summis tandem laevibus. Ramuli angulati. Phyllodia viridia coriacea glabra vel pilis sparsis albis vestita falcata linearia vel angustissime elliptica 9–20 cm longa 0·4–1·7 cm lata, nervis principalibus 3–5 prominentibus parallelis, nervis minoribus longitudinalibus anguste reticulatis, apice obtuso, mucrone uncinato calloso, glandula unica marginali orbiculari circiter 2–7 mm supra constrictiones basales aurantiacas distanti. Spicae cremeo-flavae axillares singulae vel binae 3–5 cm longae; floribus 20–34 sessilibus pro rata magnis 5-meris, secundum axin sparse dispositae, pedunculis glabris vel puberulis circiter 4–10 mm longis circiter 1 mm latis. Calyx flavido-viridis cupulatus circiter 1–1·3 mm longus circiter 1–1·5 mm latus, lobis acutis dense ciliolatis et pallide brunneis, tubo glabro vel ciliis paucis albis vestito. Corolla flavido-viridis glabra 2·5–3·5 mm longa quinquelobata fere usque ad basin dissecta; lobi elongati, apicibus incurvatis subacutis vel obtusis, marginibus granulosis. Stamina libera numerosa pallide flava, filamentis circiter 4 mm longis; antherae biloculares. Ovarium subsessile oblongum atroviride demum brunneum circiter 1–1·2 mm longum 0·4–0·5 mm latum, pilis appressis argenteis ornatum. Stylus hinnuleus 5–5·5 mm longus lateraliter affixus; stigma parum expansum. Legumina tarde dehiscentia (ut videtur indehiscentia sed siccitate provecta secedentia), pallide brunnea nitida glabra turgido-distenta lignea recta vel torta 7–15 cm longa 1–2 cm lata et 0·7–0·9 cm crassa. Semina in legumine transverse affixa laevis nitida nigro-brunnea 6–9 mm longa 5–7 mm lata et 0·7–0·9 mm crassa parum compressa ovoidea vel fere orbicularia, areola prominente brunnea oblonga, funiculo albo parum convoluto recto circiter 4 mm longo.

Tree or shrub 3–4 m high with pendulous branchlets and phyllodes, the bark of the trunk furrowed, hard, persistent, greyish black and tending to become smooth on the upper branches. *Branchlets* angular. *Phyllodes* green, coriaceous, glabrous or with a sparse covering of fine, white, appressed hairs, falcate, linear or very narrowly elliptical, 9–20 cm long, 0·4–1·7 cm broad, with 3–5 parallel main veins, the minor veins longitudinal, narrowly reticulate, the apex obtuse with a hooked callus, the single marginal gland not prominent, orbicular, about 2–7 mm above the orange basal constrictions. *Inflorescences* cylindrical, creamy-yellow, 3–5 cm long, with 20–34 widely spaced, comparatively large, 5-merous, sessile flowers, 1 or 2 spikes per axil, the peduncles glabrous or puberulous, about 0·4–1 cm long, about 1 mm wide. *Buds* green, rather elongated. *Calyx* yellowish-green, cupular, about 1–1·3 mm long, about 1–1·5 mm wide, dissected to about 1/5 of its length into 5 acute lobes of which the apical portions are densely ciliolate and light brown, the tube glabrous or with a few white cilia. *Corolla* yellowish-green, glabrous, 2·5–3·5 mm long, dissected almost to the base into 5 glabrous elongated petals, the apex incurved and subacute to obtuse, the margins granulose. *Stamens* free, numerous, light yellow, the filaments about 4 mm long. *Anthers* bilocular. *Ovary* subsessile, oblong, dark green, later brown, about 1–1·2 mm long, 0·4–0·5 mm broad, densely clothed with appressed silvery hairs. *Style* fawn, 5–5·5 mm long, glabrous, borne laterally on the ovary, the stigma slightly expanded. *Legumes* dehiscent (apparently indehiscent but splitting when very dry), light brown, glossy, glabrous, bloated, woody, straight or twisted, convex over the seeds but not constricted between them, often breaking between the seeds, 7–15 cm long, 1–2 cm and 0·7–0·9 cm thick. *Seeds* transversely attached in the legume, smooth, glossy, blackish brown, 6–9 mm long, 5–7 mm broad and 3–4 mm thick, ovoid to almost orbicular, slightly compressed, the areole prominent, brown, oblong, the funicle white, slightly convoluted, not looped, about 4 mm long, slightly thickened into an aril.

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‡ See Bentham's classification in Flora Australiensis II (1864) 316.

Holotype: 28 miles [45·1 km] W. of Mongrel Downs Homestead, Northern Territory, 129° 15′ E., 19° 36′ S., J.R. Maconochie No. 983, 20.4.1971 (NT 30811), located in the National Herbarium of New South Wales, Sydney. Isotypes: NT; AD; MEL; CANB; BRI; PERTH; K.

Distribution: Northern territory, in the Central Western region near the border of Western Australia in the vicinity of Mongrel Downs station.

Habitats: growing in red, cracking, clayey soils (often with lateritic pebbles) in almost monotypic shrub communities. These communities appear to form bands along drainage lines between the Mitchell Grass-Woollybutt (*Astrebla pectinata-Eragrostis xerophila*) plains or along the lower edges of ridges on the edges of these plains.

Flowering Period: August.

Legumes: borne on the shrubs or trees in April.

Specimens Examined: Northern Territory: 10 miles [16·1 km] SW. of MacFarlane Bore, Mongrel Downs Station, 129° 15′ E., 20° 30′ S., J.R. Maconochie No. 997, 21.4.1971 (NT 30825; NSW); 16 miles [25·8 km] W. of Mongrel Downs, J.R. Maconochie No. 951, 4.8.1970 (NT 27849; NSW); 80 miles [128·8 km] W. of The Granites, A.J. Mahood 9.4.1962 (NT 8776; NSW).

The leaves and branches (when broken) and the flowers produce an unpleasant odour similar to Gidyea (*Acacia cambagei* R.T. Bak.) and Georgina Gidyea (*A. georginae* F.M. Bail.). The trees are heavily grazed by livestock.

This species is a member of the Juliflorae Falcatae according to Bentham's classification in Flora Australiensis II (1864) 316. The specific epithet *crassifrugis* refers to the distended fruit which characterizes this species.

The second author has grown seedlings of this taxon at Alice Springs. Two large cotyledons appear first followed by a leaf consisting of 6 or 8 leaflets and a second leaf or 6 leaflets. Thirdly there is a large phyllode or a phyllode having a bipinnate tip with 4 leaflets in each pinna.

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We wish to thank Mr H.K. Airy Shaw, Royal Botanic Gardens, Kew, for his kindness in checking the Latin description of this new species.

Notes on Australian Taxa of *Acacia* No. 3

MARY D. TINDALE

SUMMARY

Two new Australian species of *Acacia* (Family Mimosaceae) are described, namely *A. wanyu* (Juliflorae Stenophyllae) and *A. anaticeps* (Plurinerves Dimidiatae). Notes are made on *A. gilesiana*, a rare South Australian species, and *A. cunninghamii* var. *tropica* is raised to specific rank.

Due to the pending publication of a further section on the phytochemistry of the Australian species of *Acacia* by Prof. D.G. Roux and myself, it is necessary to provide names for two new taxa and raise another species to specific rank.

Acacia anaticeps *Tindale*, **sp. nov.**

Arbor glabra, circiter 2·5–5 m alta, cortice trunci suberoso profunde corrugato. Ramuli angulati. Phyllodia ambitu caput anetinum simulentia, subflabellata, glabra, coriacea, curvata, in triente superiore latissima, valde oblique falcata, obovata, 4–7 cm longa, 1·2–(3·2–4·5)–6 cm lata, apice acuminato vel obtuso mucrone crasso, basi sensim contracta, nervis principalibus 5–7, nervis minoribus reticulatis, glandula unica marginali parva orbiculari vel reniformi circiter 2–4 mm supra constrictiones basales nitidas prominentes sita. Capitula 2–2·5 mm diametro, cremeo-flava, in paniculam terminalem vel axillarem disposita, floribus 4–5 pro capitulo, pedunculis glabris circiter 2–5 mm longis circiter 0·2 mm latis. Bracteae atro-brunneae, latissime ovatae, marginibus erosis. Calyx quinquelobatus, usque ad basin vel fere usque ad basin dissectus; sepala glabra, late elliptica, acuta vel subacuminata, 0·3–0·4 mm longa, 0·3–0·4 mm lata, pallide hinnulea, apicibus brunneis vel rufo-brunneis. Corolla cremea, glabra, quinquelobata, usque ad basin vel fere usque ad basin dissecta; petala elliptica, acuta vel acuminata, circiter 0.4 mm lata, 1–1·2 mm longa, marginibus apicibusque minute granulosis. Stamina libera, numerosa; filamenta 1·2–1·5 mm longa, pallide cremea; antherae biloculares, bicolores. Ovarium subsessile, atro-brunneum, ovoideum, 0·3–0·6 mm longum, circiter 0·2 mm latum, glabrum. Stylus lateraliter affixus, cremeus, glaber circa 1·2 mm longus; stigma parum expansum. Legumina moniliformia, lignea, brunnea, usque 28 cm longa, curvata, saepe convoluta, in maturitate alata, marginibus crassiusculis, valvis super semina convexis, sectionibus globosis 1·5–3 cm longis 1–2 cm latis. Semina in legumine longitudinaliter vel oblique affixa, intense atro-brunnea, 0·9–1·4 cm longa, 0·8–1·2 cm lata, parum compressa, ovoidea vel orbicularia; areola impressa prominens, pallide brunnea vel atro-brunnea, 3–4 mm longa et 1·5–2 mm lata; funiculus angustus, nitidus, semel laqueatus deinde in arillam super seminis apicem expansus.

A small glabrous shrubby tree about 2·5–5 m high either with branches low to the ground or with a trunk 2 m high, the bark corky and deeply corrugated (i.e. of the "ironbark" type). *Branchlets* angular. *Phyllodes* resembling a duck's head, subflabellate, glabrous, coriaceous, curved and broadest in the upper third of the phyllodes, very obliquely falcate, obovate, 4–7 cm long, 1·2–(3·2–4·5)–6 cm broad, the apex acuminate or obtuse with a hard mucro, gradually contracted at the base, with 5 to 7 main veins having reticulations between them, the margin bearing a small orbicular or reniform gland 2–4 mm above the dark prominent basal constrictions. *Inflorescences* in terminal or axillary panicles, cream-coloured, 1–3 orbicular capitula borne at intervals along the axes in the axils of small modified phyllodes or dark brown bracts, 4–5 flowers in each orbicular flower-head which is 2–2·5 mm in diameter, the peduncles glabrous, 2–5 mm long, about 0·2 mm in diameter. *Bracts* dark brown, very broadly ovate, the margins erose. *Bracteoles* dark brown, broadly ovate or ovate, entire. *Calyx* divided to the base or almost so into 5 sepals which are 0·3–0·4 mm long, 0·3–0·4 mm broad, glabrous, broadly elliptical, pale fawn with brown or reddish brown apices. *Corolla* cream-coloured, glabrous, separated into 5 free or almost free petals which are elliptical, acute or subacuminate, 1–1·2 mm long, about 0·4 mm broad, the margins and apices minutely granulose. *Stamens* free, numerous, the filaments 1·2–1·5 mm long and cream-coloured, the anthers bilocular and bicolorous, the dorsal surface dark brown or chestnut-brown, the ventral surface cream-coloured. *Ovary* subsessile, dark brown, more or less ovoid, 0·3–0·6 mm long, about 0·2 mm broad, glabrous. *Style* borne laterally on the ovary, cream-coloured, ca. 1·2 mm long, the stigma very slightly expanded. *Legumes* moniliform, woody, brown, up to 28 cm long, curved, often twisted, winged when mature, the margins rather thick, the valves convex over the seeds, each bead-like portion 1·5–3 cm long and 1–2 cm broad. *Seeds* longitudinal or oblique in the legume, very dark brown, 0·9–1·4 cm in length, 0·8–1·2 cm broad, slightly compressed, ovoid or orbicular, the areole impressed, prominent, light brown or dark brown, 3–4 mm in length, 1·5–2 mm in breadth, the funicle narrow, dark, with one loop and slightly dilated into an aril on top of the seed.

HOLOTYPE: Close to Wallal Downs homestead, Western Australia, on mud, a nicely shaped tree 12–15 ft. high, F. Lullfitz 5.1970 (NSW 106771). ISOTYPES: PERTH; K; US; L; CANB; AD; BRI; MEL; A.

DISTRIBUTION: WESTERN AUSTRALIA, "about 160 miles [257·6 km] from Port Hedland (on the Great Northern Highway) to the Anna Plains area just before Nita Downs".

ECOLOGICAL HABITAT: On salt flats, on grassland in red sand and "on the reddish sandy pindan country which adjoins the coastal salt mud flats around 80 Mile Beach".

FLOWERING PERIOD: May.

LEGUMES: Mature legumes occur on the trees from late July to September but might be from flowers of the previous year.

SPECIMENS CITED: WESTERN AUSTRALIA: Great Northern Highway, 225 miles [362·3 km] S. of Broome, tree 10 ft. high, in red sand, in grassland, frequent, I. Olsen No. 509, 29.7.1967 (NSW 106769), in fruit; Wallal Downs, F. Lullfitz 9.1969 (NSW 106770); ditto, F. Lullfitz 9.1971 (NSW 106832), in fruit.

Mr F. Lullfitz, Department of the North West, Western Australia, very kindly supplied me with both flowering and fruiting material of this new species as well as furnishing details of its distribution, habit and habitat.

The specific epithet *anaticeps* refers to the shape of the phyllodes which resemble the head of a duck.

According to Bentham's classification of the genus *Acacia* in Flora Australiensis II (1864) 302, *A. anaticeps* would be placed in the Plurinerves Dimidiatae based on the orbicular inflorescences and broad phyllodes with several prominent veins having reticulate venation between them. However, the markedly moniliform legumes and very few-flowered capitula are unusual in this group of species.

Acacia wanyu *Tindale*, **sp. nov.**

Frutex vel arbor, usque 3 m alta. Ramuli laeves, atro-grisei, teretes, rimis parvis notati, apicem versus pilis brevibus appressis griseis vestiti. Phyllodia acicularia, teretia, subtiliter striata, 7–17 cm longa, 0·8–1·2 mm lata, pallide glauco-viridia, erecta, curvata, glandula unica parva orbiculari marginali 0·5–3 mm supra constrictiones basales distante, pilis brevibus appressis argenteis vestita, apice saepe mucrone glanduligera praedita. Spicae aureae in axillis phyllodiorum singulae, 1·2–2 cm longae, circiter 0·4–0·6 cm latae, floribus numerosis secundum axin haud crebre dispositis 5-meris sessilibus; pedunculi circiter 0·4–1 cm longi, circiter 0·5 mm lati, pilis argenteis parum patentibus dense ornati. Bracteolae spathulatae, petiolo angusto, pilis longis albis vestitae. Calyx pallide hinnuleus, campanulatus, circiter 0·4–0·5 mm longus, circiter 1 mm latus, quinquelobatus, lobis acutis plus minusve oblongis ¾ longitudinis tubi aequantibus, pilis plus minusve rigidis albis in fasciculum apicalem et secus margines dispersis, tubo brevi pilis similibus vestito. Corolla aurea, campanulata, 1·2–2 mm longa, quinquelobata; petala acuta, glabra, ½ longitudinis tubi aequantia, apicibus valde papillosis et subfuscioribus. Stamina libera, numerosa, aurea, filamentis 3–3·5 mm longis; antherae biloculares. Ovarium subsessile, viride vel pallide brunneum, plus minusve ovoideum, 0·8–1 mm longum, 0·3–0·4 mm latum, pilis longis albis villosis dense ornatum. Stylus glaber, atro-flavidus, circiter 4 mm longus, lateraliter affixus; stigma parum expansum. Legumina moniliformia, crasse coriacea vel lignea, corrugata, pallide brunnea vel brunnea, obscura vel parum nitida, 6·5–13·5 cm longa, 0·6–1 cm lata, valvis super semina plus minusve convexis. Semina in legumine longitudinaliter affixa, 6–9 mm longa, 3–4 mm lata, ovoidea vel oblonga, atro-brunnea; areola 2·5 mm longa; funiculo hinnuleo filiformi laqueato et convoluto arillum obscurum vel nitidum super seminis apicem efformante.

Shrub or tree up to 3 m high. *Branchlets* smooth, dark grey, terete, with small slit-like creases, clothed towards the apex with short, appressed, grey hairs. *Phyllodes* acicular, terete, finely striate, 7–17 cm long, 0·8–1·2 mm broad, glaucous, light green, erect, curved, bearing a small, marginal, orbicular gland 0·5–3 mm above the basal constrictions, clothed with short, appressed, silvery hairs, the apices terminating in a darker mucro often bearing a gland. *Inflorescences* golden yellow, spicate, occurring singly in the axils of the phyllodes, 1·2–2 cm long, about 0·4–0·6 cm wide, with numerous, not closely spaced, 5-merous, sessile flowers, the peduncles about 0·4–1·0 cm long, about 0·5 mm wide, densely clothed with silvery, slightly spreading hairs. *Bracteoles* spathulate, with a narrow petiole, clothed with long white hairs. *Calyx* pale fawn, campanulate, about 0·4–0·5 mm long, about 1 mm broad, dissected to about ¾ of its length into 5 acute, more or less oblong lobes bearing more or less stiff white hairs in an apical tuft and scattered along the margins, the short tube also clothed with similar hairs. *Corolla* yellow, campanulate, 1·2–2·0 mm long, dissected to ½ of its length into 5 acute glabrous petals with markedly papillose, slightly darker apices. *Stamens* free, numerous, golden yellow, the filaments 3–3·5 mm long; anthers bilocular. *Ovary* subsessile, green or light brown, more or less ovoid, 0·8–1 mm long, 0·3–0·4 mm broad, densely clothed with long white villous hairs. *Style* glabrous, dark yellow, about 4 mm long, laterally affixed, the stigma slightly expanded. *Legumes* moniliform, thickly coriaceous or woody, corrugated, light brown or brown, dull or slightly glossy, 6·5–13·5 cm long, 0·6–1 cm broad, constricted between the seeds, the valves more or less convex over the seeds. *Seeds* longitudinal in the legume, 6–9 mm in length, 3–4 mm in breadth, ovoid to oblong, dark brown, the areole 2·5 mm long, the funicle fawn, filiform, looped and convoluted, expanded into a dull or glossy, brown aril on top of each seed.

HOLOTYPE: 1 mile from Wyloo Homestead, Wyloo Station, Ashburton River, Western Australia, in sandy wash country, 2·7–3 m tall, W. Henwood 8.1971 (NSW 106798). ISOTYPES: K; PERTH; MEL; US; CANB.

DISTRIBUTION: WESTERN AUSTRALIA: in the Ashburton River Valley and for a short distance along the coast as far as the Robe River.

Habitats: on alluvial flats of sandy or gravelly nature associated with *Acacia xiphophylla* and *A. victoriae* as well as sometimes with a ground layer of *Triodia pungens*.

Flowering Period: July, also in May after heavy rains (personal communication by Henwood).

Legumes: borne on the shrubs or trees in late August and early September.

Specimens Examined: Western Australia: Yarraloola, near the Robe River, wattle 1·6 m high, shrub steppe, wattles and soft spinifex, J.S. Beard No. 6161, 30.8.1970 (NSW; PERTH); Ashburton Downs, wattle 1·8–2·4 m high, on gravel plains, J.S. Beard No. 6116, 26.8.1970 (NSW; PERTH).

Dr J.S. Beard drew my attention to this taxon which became well known to him during his ecological studies in Western Australia. He also suggested the specific epithet "wanyu" which is the vernacular name for this wattle.

Acacia wanyu belongs to the Juliflorae Stenophyllae according to Bentham's classification in Fl. Austral. II (1864) 302–319 and Maiden and Betche's scheme in A Census of New South Wales Plants (1916) 89–97. It is allied to *A. longiphyllodinea* Maiden and *A. aciphylla* Benth., both of which are native to Western Australia. In *A. longiphyllodinea* the acicular phyllodes are usually 15–40 cm long, coarsely pungent (without an apical gland), coarsely striate, quite glabrous and with unwrinkled basal attachments, whereas in *A. wanyu* the acicular phyllodes are 7–17 cm long, pungent-pointed (often with a small gland near the apex), finely striate, clothed with short appressed silvery hairs and having wrinkled basal attachments. The inflorescences of *A. longiphyllodinea* are 1·5–2 cm long with closely packed flowers and borne on dark purplish-brown, glabrous peduncles 0·8–1·2 cm long but in *A. wanyu* the inflorescences are 1·2–2 cm long with more distantly spaced flowers and borne on pale greyish-green peduncles 0·4–1·0 cm long and densely clothed with silvery spreading hairs. The calyces of the flowers in the former species are truncate or semi-truncate and dissected to 2/3 of their length into 5 erose sepals which bear long scattered hairs on the apices and nerves, whereas in the latter species the calyces are campanulate, dissected to about $\frac{3}{4}$ of their length into 5 sepals which bear rather long, white, stiff hairs especially at the apices and along the margins. *A. aciphylla*, another closely related species, is characterized by stiffly erect, terete, finely striate, pungently pointed phyllodes but the inflorescences are sessile or almost so (instead of having peduncles about 0·4–1·0 cm long as in *A. wanyu*), the ovaries are glabrous (instead of villose) and the calyces are dissected to about $\frac{1}{5}$–$\frac{1}{4}$ of their length (instead of $\frac{3}{4}$ of their length).

Note added in proof:

The following specimen of *A. wanyu* has also been examined:

Upper Rudall River area, Western Australia, c. 122° 15′ E, 22° 30′ S, shrub 6-7 ft tall; stem dividing at ground level into c. 3 main branches; bark grey, smooth in branches, fissured at base; phyllodes more or less erect, silvery light green; pods hanging, surface smooth, B.R. Maslin No. 2048, 9.1971 (PERTH; NSW).

Acacia tropica (*Maiden et Blakely*) *Tindale*, **stat. nov.**

BASIONYM: *Acacia cunninghamii* Hook. var. *tropica* Maiden et Blakely in J. Roy. Soc. W.A., XIII (1927) 31–32, t. 22, ff. 1–5.

HOLOTYPE: Hells Gate, Roper River, Northern Territory, W. Baldwin Spencer 2.8.1911 (NSW).

FLOWERING PERIOD: June-August.

REPRESENTATIVE SPECIMENS:—NORTHERN TERRITORY: 30 miles [48·3 km] E. of O.T. Station, an erect tall shrub 8 ft. [2·4 m] high, in deep sandy soil with *Acacia* spp. and *Eucalyptus ferruginea*, R.A. Perry No. 1872, 4.8.1948 (CANB; NSW). QUEENSLAND: New Highland Plains Homestead, 18° 36′ S., 138° 08′ E., tree up to 3 m high with sparse whippy branches and red brown smooth bark, flowers bright yellow and cylindrical, found along banks of a watercourse below sandstone hills, N.M. Henry 24.7.1971 (NT 33008; NSW); Corinda-Westmoreland Stations, petioles orange-yellow when fresh, C.H. Gittins No. 1286, 6.1967 (NSW 101427); Westmoreland Station, small tree with dark-coloured bark, C.H. Gittins No. 845, 6.1963 (NSW 106866); 17 miles SW. of Claraville Station, with *Melaleuca* spp. on deep sandy yellow podsolic soil, an erect low tree or tall shrub 15 ft. [4·5 m] high, with brown and fibrous bark, M. Lazarides No. 3932, 9.8.1953 (CANB; NSW).

According to Bentham's classification in Fl. Austral. II (1864) 316–7, this species is a member of the Juliflorae Falcatae. It occurs in Western Queensland, the Northern Territory and the northern region of Western Queensland. A detailed description and illustrations are provided by Maiden and Blakely, ibid. 31–32, t. 22, ff. 1–5.

The salient features of *A. tropica* are the glabrous branchlets, the spike-like inflorescences which are about 4 to 5·5 cm long and composed of densely packed, golden yellow flowers, the glabrous peduncles which are 0·5 to 1·5 cm long, the glabrous trinerved phyllodes with the two lower veins confluent for 1 to 2 cm of their length, the coriaceous keeled petals and the glabrous calyces which are about 0·5 to 0·6 mm long with a fringe of marginal cilia. As stated by Maiden and Blakely, ibid. 32, the corollas and calyces persist on the spikes after the stamens have fallen. This species is a member of the *A. cunninghamii* group which occurs in Eastern and Northern Australia.

Acacia gilesiana

Acacia gilesiana *F. Muell.* in Austral. Suppl. Chem. Drugg. V (1882) 26; Black, Fl. S. Austral., pt. II, ed. 2 (1948) 423.

ISOTYPE: near Mt. Eba (north of Kingoonya on the East-West Railway), South Australia, E. Giles 1882 (NSW).

SPECIMEN CITED:—SOUTH AUSTRALIA: 5 miles [8·1 km] S. of Maralinga, on the tops of sandridges, scattered shrubs up to 3 m high, stiff ascending stems, phyllodes grey green and gold inflorescences, 5 inch rainfall, B. Copley 2682, 29.7.1969 (NSW).

The brief original description is amplified here:—

Branchlets glabrous, purplish-brown, with fine ridges. *Phyllodes* stiffly erect, slightly glaucous, greyish green, terete, glabrous, 6–13 cm long, 1·5–1·8 mm in diam., finely striate with parallel veins, the apex greyish and subacute with a hard black tip. *Bracts* subtending each capitulum, glabrous. *Inflorescences* consisting of a raceme of heads; each capitulum composed of about 20–23 golden yellow flowers, the peduncle glabrous, purplish-brown, 1–2 cm long. *Bracteoles* fawn, peltate, the expanded apical portion ciliate along the margin, the narrow stalk also ciliate. *Calyx* tubular, deeply divided from 1/3 to 4/5 of its length into 5 broadly rounded, dark orange, spathulate sepals which are ciliate along the margins, the tube glabrous except towards the base and sometimes sparsely along the ridges, fawn except brown at the base. *Corolla* dark orange-yellow, 1·5–2 mm long, dissected to about $\frac{1}{3}$ or $\frac{1}{2}$ of its length, glabrous, with 5 subacute incurved petals, the margin papillose, the apex with a tuft of short, yellow hairs. *Stamens* free, numerous, bright golden yellow, 2·2–2·5 mm long, the anthers numerous. *Ovary* subsessile, brown, narrowly oblong, often curved, 0·8–1 mm long, 0·2–0·3 mm broad, glabrous. *Style* glabrous, dark yellow, often convoluted, 1·4–1·5 mm long, laterally attached, the stigma slightly expanded.

This species is very poorly represented in herbaria, so that it seemed worthwhile to record Copley's recent collection from the Maralinga district. According to Bentham's classification in Fl. Austral. II (1864) 305, *A. gilesiana* would be placed in the Calamiformes Plurinerves.

ACKNOWLEDGEMENTS

I am most grateful to Mr H.K. Airy Shaw, Royal Botanic Gardens, Kew, for checking my Latin descriptions, as well as to Mr B. Copley, Mr C.H. Gittins, Mr W. Henwood, Mr F. Lullfitz, Mr B. Maslin and Mr I. Olsen for making special collections for me.

Arthrochilus F. Muell. and related genera (Orchidaceae) in Australasia

D. F. BLAXELL

SUMMARY

The status of some Australasian orchid genera is reviewed. A new species (*A. byrnesii*) and a segregate genus from *Caleana* R. Br. (*Paracaleana*) are described. Keys to the genera and species are included. The distribution of all species is mapped and plates of representatives of all genera are included.

The genus *Arthrochilus* was published by F. Mueller in 1859 to accommodate the taxon collected by him at Moreton Bay (Queensland) and later described as *A. irritabilis*. In the description of the genus, Mueller stated:

> "Genus characterum Leptoceratis, Drakeae, Spiculaeae et Caleyanae magis minusve particeps."

H.G. Reichenbach, in 1871, transferred *A. irritabilis* to Lindley's genus *Drakaea*, with the result that the monotypic genus *Arthrochilus* became a synonym of *Drakaea*. Also, Reichenbach transferred Lindley's monotypic Western Australian genus *Spiculaea* to *Drakaea*. Bentham, in 1873, followed Reichenbach's treatment of these three genera. Mueller apparently agreed with the latter, because in 1889 he described a new species, *Drakaea huntiana*, and made no reference to his genus *Arthrochilus*. In fact, he referred to the combination *Drakaea irritabilis* (F. Muell.) Reichenb. f. without comment.

Schlechter, in 1921, considered that the inclusion of the three species, *Drakaea ciliata*, *D. irritabilis* and *D. huntiana*, in the same genus as *D. elastica* (the type species) was "un-natural", and he transferred them to *Spiculaea* and retained the genus *Drakaea* for the three Western Australian species, *D. elastica*, *D. glyptodon* and *D. fitzgeraldii*.

He attempted also to rationalize the supra-generic grouping of these and related genera and he erected a new sub-tribe, the *Drakaeinae*. In this he included *Drakaea* Lindl., *Spiculaea* Lindl., *Caleana* R. Br. and *Chiloglottis* R. Br. He enumerated the differences between the four genera and proposed two sections for *Spiculaea*; Section 1, *Eu-spiculaea* (represented by *S. ciliata* Lindl.); and Section 2, *Arthrochilus* [which included *S. irritabilis* (F. Muell.) Schlecht. and *S. huntiana* (F. Muell.) Schlecht.]

Rogers, in 1926, agreed with Schlechter's treatment of these genera and no re-assessment of their status has been made until now. (*Chiloglottis* is omitted and will be treated in a later paper.)

It has been apparent to many botanists since Bentham that to exclude *Caleana* from united *Drakaea* sens. orig. and *Spiculaea* sens. orig. is scientifically untenable, as the floral characteristics of *Caleana* and *Drakaea* sens. orig. are more alike than those of *Spiculaea* sens. orig. and *Drakaea* sens. orig. However, to unite these three genera would also be untenable because of the apparent genetic isolation of these genera due to morphological specializations for pollination by different insects. Very little is known of the method(s) of pollination in the species of these three genera, but from the highly modified floral structure, including the shape, colour and structure of the labella, it is assumed that different insect species (perhaps from different Orders) are pollination vectors for the different orchid species.

Because of these highly modified floral structures of the individual species and the apparent similarities between them, the generic rather than the specific limits have been highly subjective and to some extent controversial amongst botanists. The species of *Spiculaea* sens. orig. and *Arthrochilus* are very distinct from each other and are very distinct from the species of *Drakaea* sens. orig. and *Caleana*.

I consider that, (i) the method of attachment of the labellum to the column or column "foot", (ii) the position of the labellum (above or below the column), (iii) the presence or absence of a column "foot" and (iv) the overall presentation of the flower(s) under natural conditions (including the position of the petals, sepals, and column in relation to the labellum and ovary in the open flower) are of fundamental adaptive and reproductive importance in this group. I propose therefore, in this paper, to

(a) re-instate the genus *Arthrochilus* F. Muell.;

(b) make the necessary new combinations subsequent to (a);

(c) describe a new species of *Arthrochilus* from the Northern Territory;

(d) unite two species of *Caleana* at present treated as distinct;

(e) erect a new genus for some species presently included in *Caleana* R. Br.;

(f) make the necessary new combinations subsequent to (e).

KEY TO GENERA

1. Leaf ovate-cordate, present at flowering.
    2. Column wings broad, forming a pouch; extending from stigma to point of attachment of labellum .... E. *Paracaleana*
    2.* Column wings triangular-falcate, not forming a pouch, but with a narrow wing extending to stigma .... C. *Drakaea*

1.* Leaf linear, lanceolate, or not present at flowering.
    3. Labellum below column .... B. *Spiculaea*
    3.* Labellum above column.
        4. Labellum partly or wholly covered with hair-like processes .... A. *Arthrochilus*
        4.* Labellum smooth or tuberculate, but without hairs or hair-like processes.
            5. Labellum smooth and shining .... D. *Caleana*
            5.* Labellum tuberculate .... E. *Paracaleana*

A. ARTHROCHILUS

Arthrochilus *F. Muell.*, Fragm. Phytogr. Austral. I (1859) 42.

Key to the Species

1. Leaves present at flowering, lanceolate; as long as, or slightly shorter than the inflorescence .... *A. byrnesii* (fig. D1, 2) 3.

1.* Leaves absent at flowering, or if present, then less than half the length of the inflorescence.
    us/ 2. Distal end of labellum divided into two "tails" which are covered in hair-like processes .... *A. huntiana* (fig. B1, 2) 2.
    2.* Distal end of labellum entire and not covered with hair-like processes .... *A. irritabilis* (fig. A1, 2) 1.

1. Arthrochilus irritabilis *F. Muell.*, Fragm. Phytogr. Austral. I (1859) 43.

SYNONYMS: *Drakaea irritabilis* (F. Muell.) Reichenb. f., Beitr. Syst. Pfl. (1871) 68.

Spiculaea irritabilis (F. Muell.) Schlechter in Feddes Rep. XVII (1921) 81–83.

DISTRIBUTION: PAPUA; AUSTRALIA (Queensland and New South Wales), erroneously recorded for Victoria. In Australia this species is limited to the coastal strip and nearby coastal ranges from north-eastern Queensland to the northern coastal suburbs of Sydney, New South Wales. Habitats are varied, but are predominantly sclerophyllous heaths on soils derived from sandstone, and alluvial sands (Map 1).

HOLOTYPE: Moreton Bay (Queensland) (ex Herb. Mueller) (MEL 39781). This specimen is without collector's name or date.

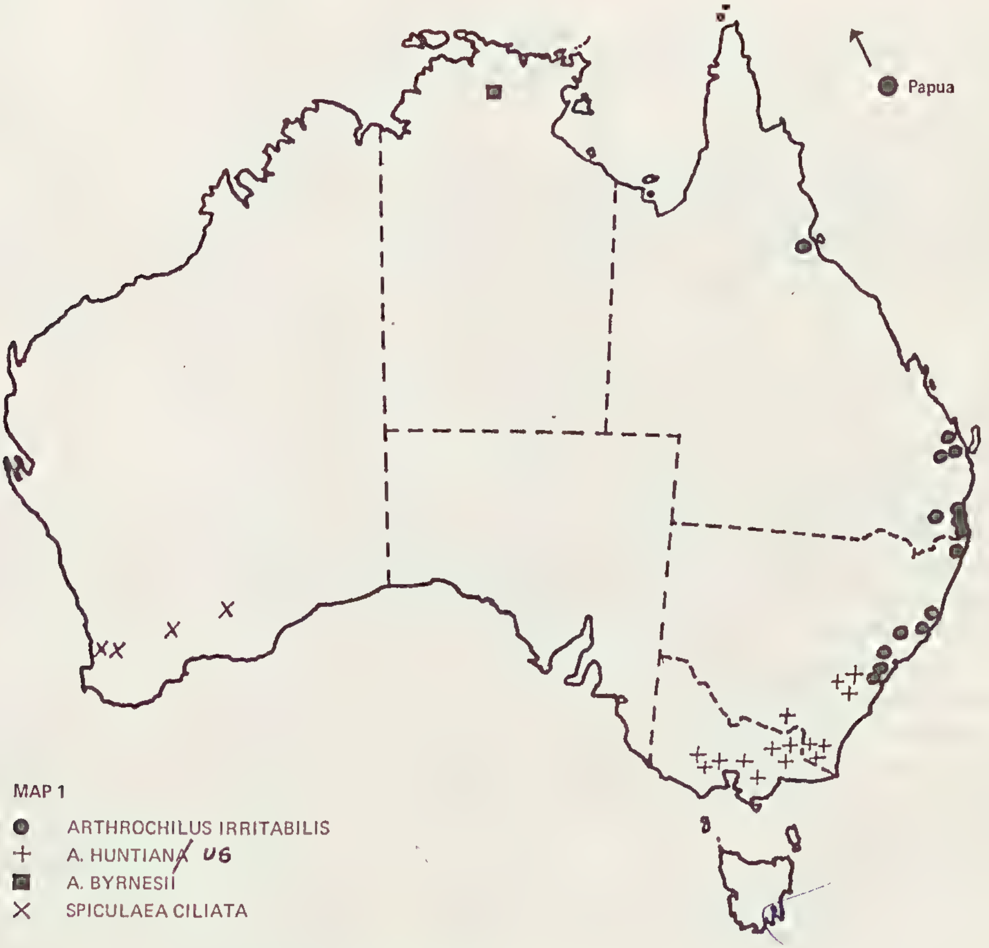
2. Arthrochilus huntian~~a~~us (*F. Muell.*) *D. Blaxell*, **comb. nov.**

BASIONYM: *Drakaea huntiana* F. Muell. in Vict. Nat. V (1889) 12, 174.

SYNONYM: *Spiculaea huntiana* (F. Muell.) Schlechter in Feddes Rep. XVII (1921) 81.

DISTRIBUTION: New South Wales and Victoria; from the Blue Mountains west of Sydney along the Great Dividing Range south to the Victorian Alps, the Dandenongs east of Melbourne and west to the Grampians. Usually at elevations over 1000 m in open forest or woodland, and on a range of soil types (Map 1).

HOLOTYPE: Tingiringi Mountain (New South Wales), W. Bäuerlen 175, 3.1889 (MEL 39764).



Map 1. Map of Australia showing distribution of *Arthrochilus* spp. and *Spiculaea ciliata.*

3. Arthrochilus byrnesii *D. Blaxell*, sp. nov.

HOLOTYPE: Waterfall Creek, South Alligator River, Northern Territory, N. Byrnes 1530, 2.4.1969 (NSW 88430), located in the National Herbarium of New South Wales, Sydney.

Herbae terrestres tuberosae. Folia 2–3, radicalia, angusto-lanceolata, ad 30 cm longa, 1–2 cm lata. Inflorescentia multiflora ad 30 cm longa. Bractea inflorescentiae ovato-lanceolata, 7 mm longa, 3 mm lata. Pedicellus circa 5 mm longus, gracilis. Ovarium 5 mm longum. Sepalum dorsale spathulatum angustum, margine incurvato. Sepala lateralia obtusata, falcata, triangulata, 6–8 mm longa, 1·0–1·5 mm lata. Petala linearia, falcata, obtusata, 7–9 mm longa, 0·5–1·0 mm lata. Labellum brevissime unguiculatum, ovato-lanceolatum, pagina superiore callum fungiformem, 2 mm altum, 2 mm diametro, dense pilosum ferens; lamina 6–7 mm longum, 2·0–2·5 mm latum, apice excisum. Columna quadriauriculata; auriculae inferiores triangulato-falcatae, 4 mm longae, basi 1 mm latae; auriculae superiores triangulatae, 0·5–1·0 mm longae. Stigma infra antheram, cupulatum, 1·0–1·5 mm diametro, margine crenulata.

Plants terrestrial, tuberous, apparently solitary and not forming clones from underground stems. *Leaves* 2–3, radical, one greatly exceeding the others in size, particularly in length. The large leaf thin, linear-lanceolate, up to 30 cm long, 1–2 cm broad, narrowed gradually to the base which encloses the peduncle. *Inflorescence* many-flowered, up to 30 cm long and usually exceeding the long leaf. *Flowers* widely spaced, lowermost about halfway along the peduncle. *Inflorescence bract* about halfway between the lowest flower and leaf base, 7 mm long, 3 mm wide, ovate-lanceolate, sheathing. *Flowers* on slender pedicels c. 5 mm long (excluding ovary), subtended by floral bracts similar in shape and size to the inflorescence bract. *Ovary* 5 mm long (in open flowers). *Dorsal sepal* narrowly spathulate, with incurved margins, not enclosing the column. *Lateral sepals* obtuse, falcate, triangular, 1·0–1·5 mm broad, 6·0–8·0 mm long, attached to the adaxial surface of the column "foot" and decurrent on the column "foot" to its point of attachment with the labellum. *Petals* 7·0–9·0 mm long, 0·5–1·0 mm broad, narrow linear, slightly falcate, obtuse. *Labellum* articulate on column "foot", very shortly clawed, ovate-lanceolate, tip of lamina with a V-shaped notch; lamina 6–7 mm long, 2·0–2·5 mm wide; upper surface of labellum with a prominent mushroom-shaped callus, 2 mm high, 2 mm diam., densely covered with hair-like processes, 0·5–1·0 mm long, the ends minutely hairy (a few scattered processes of similar size and shape are present on the lamina towards the claw). *Callus head* with a sigmoid appendage 2–3 mm long, bifid at the end, covered in hair-like processes and warty protuberances, projecting towards the base of the column. *Column* curved, slightly shorter than the dorsal sepal, its base almost at right angles to the ovary and prolonged to form a column "foot" 3 mm long, flattened dorsiventrally and also at right angles to the ovary. Two pairs of "wings" or auricles are present, the larger pair attached on the sides of the dorsiventrally flattened column about halfway between the ovary and stigma, falcate-triangular, 4 mm long, 1 mm wide at the base which is decurrent on the edge of the column; the smaller pair of auricles attached behind the anther, triangular, 0·5–1·0 mm long. *Anther* terminal on column. *Stigma* below the anther, cup-shaped, 1·0–1·5 mm diam. with crenulate margin. *Pollinia* not seen.

The above description was compiled from herbarium specimens collected from the type locality in two successive years (1969 and 1970). No other localities or collections are known to the author or the collector. In my opinion descriptions of new species should be made whenever possible from fresh material and not from pressed and dried specimens only, but the two collections of this species show no great variation and the species is so very distinct from the previously described taxa in this and related genera that it seems desirable to include the description in this paper.

Terrestrial orchid species from the Northern Territory are not well known, and it is possible that more new taxa will be discovered in the future.

Distribution: This species is known only from the type locality. The habitat is a sclerophyllous woodland on top of a sandstone plateau (Map 1).

Specimens Examined: Northern Territory: Waterfall Creek, South Alligator River, N. Byrnes 1790, 4.1970 (NSW); N. Byrnes 1530, 4.1969 (NSW)—Holotype.

B. SPICULAEA

Spiculaea *Lindl.* in Bot. Reg. App. Veg. Swan R. Col. (1840), lvi, fig. 4.

Spiculaea ciliata Lindl., loc. cit.

I consider that the major differences between this monotypic Western Australian genus and the others mentioned in this paper warrant their separation at the generic level. The principal difference between *Spiculaea ciliata* and all the other species covered in this paper is that in the former, the labellum is held in a position below the column when the flower is fully open, whereas the labellum of the other species is held above the column. This feature is of fundamental importance for pollination of the plants, as the presentation of the labellum to a potential pollinator appears to be very different from others in the group (fig. C1, 2).

Distribution: Known from Western Australia only, widespread and often common on granitic outcrops of the south-west (Map 1).

Holotype: Not seen (K).

C. DRAKAEA

Drakaea *Lindl.* in Bot. Reg. App. Veg. Swan R. Col. (1840), lv, fig. 3.

Drakaea elastica Lindl., loc. cit.

This is a Western Australian genus consisting of several species, the status and nomenclature of which are currently being studied by A.S. George of the Western Australian Herbarium, South Perth. However, the distinctive features of all *Drakaea* species are: (i) cordate to ovate single leaf at or near ground level, (ii) relatively long flowering stem with a single terminal flower (fig. J1, 2).

Holotype: Not seen (K).

D. CALEANA

Caleana *R. Br.*, Prodr. Flor. Nov. Holl. (1810) 329.

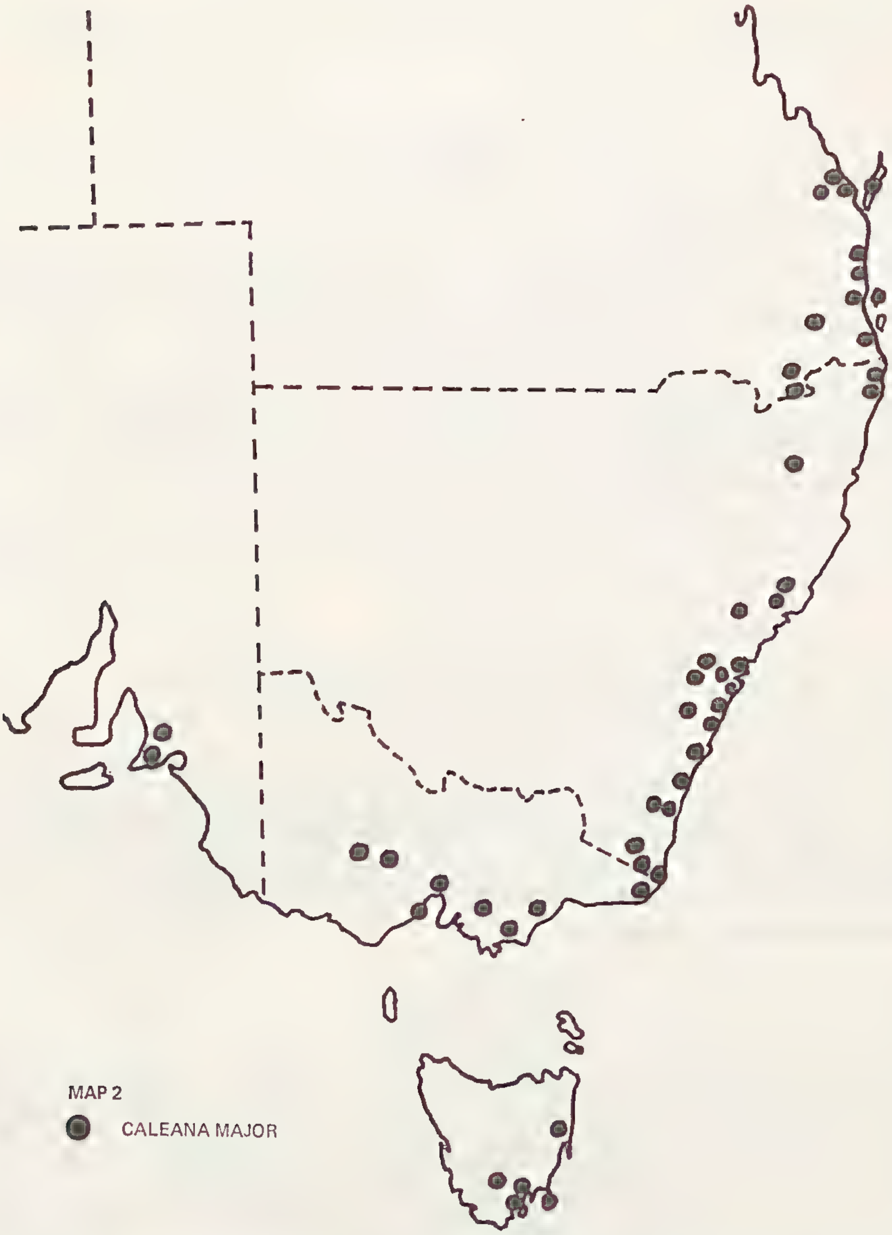
"Perianthium foliolis quinque subaequalibus, angustis. Labellum posticum, unguiculatum: Lamina peltata, cava, foramine exteriore. Columna petaloideo-dilatata. Anthera terminalis, persistens, loculis approximatis. Massae Pollinis in singulo loculo binae, pulvereae. Herbae glabrae. Bulbi indivisi, nudi, caudicem descendentum suprà fibrosum terminantes, novello pedicellata. Folium radicale unicum, lineare, basi vaginâ inclusum. Scapus bracteâ praeter florales unicâ v. nullâ, pauciflorus. Flores fusco-virides, labello columnâque rufis. Labellum mobile, reflexum, instante pluvio, luce diminutâ? vel irritatione inflexum, columnae incumbens." (R. Brown, Prodromus)

1. Caleana major *R. Br.*, loc. cit.—Lectotype of genus.

C. major is selected as the lectotype as it fits better the generic description (fig. E1, 2).

Distribution: From southern Queensland through New South Wales and Victoria to Tasmania and eastern South Australia. Habitats range from sandy heaths near the coasts to sclerophyll forests on the slopes and ranges of the mainland (Map 2).

Holotype: Not seen (K).



Map 2. Map of South Eastern Australia showing distribution of *Caleana major*.

E. PARACALEANA

Paracaleana *D. Blaxell*, **gen. nov.**

Caleana R. Br. affine, sed pede columnae elongato et alis columnae decurrentibus differt.

TYPE: *Paracaleana minor* (R. Br.) D. Blaxell (see p. 281).

This segregate genus differs from *Caleana* sens. strict. in several important features;

(i) the elongated column "foot" to the end of which are attached the lateral sepals and the labellum. The dorsal sepal and petals are attached at the base of the column where it joins the ovary;

(ii) the column wings are decurrent on the column foot as well as the column;

(iii) the column is held at right angles to the ovary (column appressed to the ovary in *C. major*);

(iv) the relative positions of the floral organs in the fully opened flower;

(v) the surfaces of the labella of all *Paracaleana* species are tuberculate to varying degrees (smooth in *Caleana*).

Obviously these two genera are closely related, but the differences between them are as distinct and as important for pollination of the individuals within the genera as those differences enumerated for *Drakaea*, *Spiculaea* and *Arthrochilus*.

It may be argued that the five genera treated in this paper could be considered as one larger genus with five sub-genera. My contention however is that treatment of distinct taxa at sub-generic level tends to obscure their differences whilst accentuating their similarities. The converse also holds, but the differences noted herein are of greater importance than the similarities. Much more than the present scanty knowledge of pollinating agents and methods of pollination of these taxa is needed to elucidate their biological relationships. Until this, and knowledge of karyotypes etc., becomes available, then interim conclusions have to be made.

Key to the Species

1. Leaf ovate-cordate, flowers few or solitary .... *P. nigrita* (fig. G1, 2) 3.
1.* Leaf linear, linear-lanceolate or lanceolate; flowers few to several.
    2. Distal end of labellum acute or mucronate .... *P. sullivanii* (fig. H1, 2) 2.
    2.* Distal end of labellum emarginate or bifid .... *P. minor* (fig. F1, 2) 1.

1. Paracaleana minor (*R. Br.*) *D. Blaxell*, comb. nov.

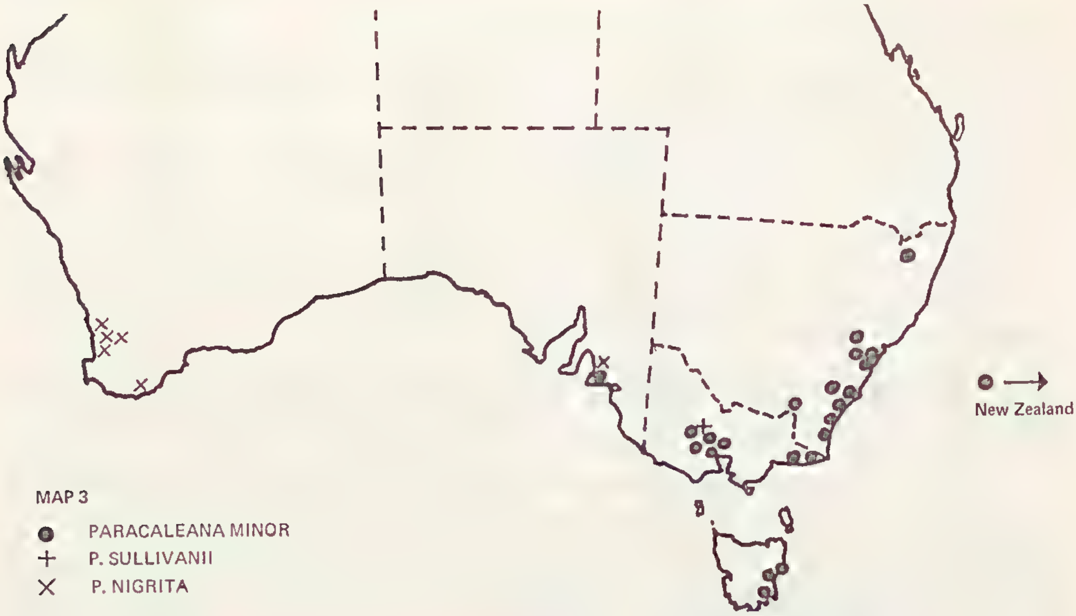
Basionym: *Caleana minor* R. Br., Prodr. Flor. Nov. Holl. (1810) 329.

Synonyms: *Caleya minor* (R. Br.) Sweet, Hort. Brit. ed. 1 (1827) 385.
Caleana nublingii W.H. Nicholls in Vict. Nat. XLVIII (1931) 15.

Distribution: Australia, from the coast and ranges of New South Wales to Victoria, Tasmania and South Australia; New Zealand, North Island. Habitats are similar to those in which *Caleana major* grows. In fact, it is not uncommon to find both species together where their ranges overlap. The absence of specimens from the North Coast Division of New South Wales as well as from Queensland should be noted (Map 3).

Holotype: Not seen (K).

Caleana nublingii is, in my opinion, no more than an aberrant form of *Paracaleana minor* and I have herein treated the name as a synonym of the latter. No specimens are known to me which have had functional anthers, nor have pollinia been observed. Only a few collections have been made and then only a few individuals from colonies of *P. minor*. It has been suggested that *C. nublingii* is a hybrid of *P. minor* and *C. major*, but if this is so, then *C. nublingii* might be expected to show characters intermediate between the two species. This is not the case, as the distinctive features of *P. minor* (prominent column "foot", tuberculate labellum and non-reflexed lateral sepals) are not "diluted" in *C. nublingii*. In the case of other interspecific or intergeneric hybrids, a 50: 50 mixture of characters from both parents is always obvious. This is not so with *C. nublingii*.



Map 3. Map of Southern Australia showing distribution of *Paracaleana* spp.

2. Paracaleana sullivanii (*F. Muell.*) *D. Blaxell*, comb. nov.

Basionym: *Caleya sullivanii* F. Muell. in Chem. and Drugg. Lond. Aust. Suppl. IV (1882) 44.

Synonym: *Caleana sullivanii* (F. Muell.) E.E. Pescott in Vict. Nat. XLIII (1926) 228.

Distribution: Known only from the Grampians in Victoria. (See discussion below). (Map 3).

Holotype: Near Mt Zero, Grampians (Victoria), D. Sullivan 1.1882 (MEL 39741).

This species is also uncommon and restricted in its distribution and has always been found in colonies of *P. minor*. Abortive anthers have been found in the few collections made. These facts suggest a situation similar to that of *Caleana nublingii*. However, the illustrations of *P. sullivanii* (drawn between 1930 and 1937) in Nicholls' "Orchids of Australia", 1969, show three whole plants plus two single flowers. The degree of development of the column "foot" is very variable. One of the single flowers has no apparent column "foot"; another has one of the same length as in *P. minor*. Each of the flowers on one of the whole plants has a column "foot", and on those of another plant the column "foot" is absent or greatly reduced. (The specimens from which Nicholls made his drawings are not now available, which is unfortunate, because of the very few specimens of this species available for examination.) The same variation in column "feet" is present on the specimens examined as listed above.

The evidence presented by Nicholls' illustrations alone suggests that *P. sullivanii* may be a hybrid between *P. minor* and *Caleana major* or an aberrant form of *P. minor*. However, further observations and collections will be necessary before any definite statements can be made. Therefore, I propose to retain *P. sullivanii* as a separate species *pro tempore* until such information becomes available.

3. Paracaleana nigrita (*Lindl.*) *D. Blaxell*, **comb. nov.**

Basionym: *Caleana nigrita* Lindl. in Bot. Reg. App. Veg. Swan R. Col., (1840) liv.

Distribution: Southwest of Western Australia in jarrah (*Eucalyptus marginata*) and marri (*E. calophylla*) forest and woodland, also in the Mt Lofty Ranges of eastern South Australia. This disjunct distribution is quite remarkable but perhaps no more so than that of *P. minor* between Australia and New Zealand (Map 3).

Holotype: Not seen (K).

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New Taxa and Combinations in *Eucalyptus*—I

L.A.S. Johnson and D.F. Blaxell

SUMMARY

Eucalyptus sphaerocarpa, *E. stenostoma*, *E. burgessiana*, *E. rupicola*, *E. barberi* and *E. sturgissiana* are described, briefly discussed and assigned to their positions in the system of classification of Pryor and Johnson, 1971. *E. dendromorpha* (Blakely) stat. nov. is established, based on *E. obtusiflora* DC. var. *dendromorpha*.

INTRODUCTION

Pryor and Johnson, 1971, foreshadowed the publication of a number of new taxa and necessary formalization of changes of rank in *Eucalyptus*. The first of these are published herein. Discussion is brief, since it is hoped to provide a more detailed treatment, where appropriate, in a later edition of the complete classification. The name of each taxon is preceded by the coding which indicates its position in the abovementioned system.

MAIBA Eucalyptus sphaerocarpa *L. Johnson et D. Blaxell*, sp. nov.

Arbor ad 25 m alta, cortice fibroso. Cotyledones reniformes. Folia adulta lanceolata plus minusve falcataque, non opposita, 6–12 cm longa, 1–2·5 cm lata; nervus intramarginalis prominens a margine circa 1 mm remotus; nervi laterales sub angulo circa 45°. Inflorescentiae axillares, 7-11-florae, umbelliformes. Pedunculus plus minusve complanatus, 10–15 mm longus, 1–3 mm latus. Alabastra matura circa 10 mm longa; hypanthio campanulato, operculo conico 3–5 mm longo. Fructus globosi, 8–15 mm diametro, valvibus 3 in hypanthio inclusis.

Holotype: Blackdown Tableland, c. 160 km W. of Rockhampton, Queensland, C.H. Gittins 932, 8.1964 (NSW). Isotypes: BRI and to be sent to K.

Distribution: Queensland: This species is only known from the Blackdown Tableland where it forms extensive stands on the sandstone plateau with EFABA *Eucalyptus baileyana*, CAFIB *E. polycarpa* and CCA:A *E. peltata*. It occurs also in the upper parts of the gullies draining the Tableland. Altitude c. 700 m.

Tree up to 25 m tall with fibrous bark to the smallest branches ("stringybark-like"). *Cotyledons* large and reniform. *Lignotuber* present. *Juvenile leaves* almost sessile, glabrous, opposite and similar in size to the adult leaves, discolorous; intramarginal vein only just distinct from the leaf margin; lateral veins regular, at c. 75° from the midvein. *Intermediate leaves* larger, to 20 cm long and 5 cm wide; intramarginal vein more irregular than in the adult leaves, c. 3 mm from the margin. *Adult leaves* lanceolate, petiolate, slightly falcate, concolorous, not opposite, 6–12 cm long and 1–2·5 cm broad; intramarginal vein prominent on both surfaces, c. 1 mm from the margin; lateral veins regular, at c. 45° to the midvein; oil glands relatively large, c. 5 per vein islet. *Inflorescences* axillary, 7-11-flowered, umbelliform; flowering peduncle flattened, 10–15 mm long, 1–3 mm broad; fruiting peduncle terete. *Pedicel* short, c. 3 mm long, merging with the campanulate hypanthium. *Operculum* single, about as long as or slightly shorter than the hypanthium, obtuse, conical to almost hemispherical. *Stamens* white to cream, all fertile; anthers reniform 0·5 mm long, 0·6 mm broad. *Fruit* globular, 8–15 mm in diameter (the size of fruits from one specimen is relatively constant, but size difference between specimens is greater); disc 1–2 mm wide, vertically depressed, staminophore narrow forming the rim of the orifice; orifice 4–5 mm diameter, regardless of fruit size; valves 3, deeply enclosed.

This species has been named for the almost spherical fruit. *E. sphaerocarpa* appears to be most closely related to MAIBB *E. planchoniana* F. Muell. on the basis of leaf venation and bark characteristics. In fact, this new species tends to demonstrate the affinity between *E. planchoniana* and MAIAA *E. pilularis* Sm., neither of which, however, occurs in the near vicinity of the Blackdown Tableland. The senior author, together with L.D. Pryor, has examined this species in the field.

Several old collections of this species in the National Herbarium of New South Wales and other herbaria have been placed with MAHAA *E. muellerana* Howitt and others have been placed as a "variety" of *E. pilularis.*

MAKIA Eucalyptus stenostoma *L. Johnson et D. Blaxell*, sp. nov.

Arbor ad 12 m alta, caudice basi 20–30 cm diametro. Cortex fibrosus ad altitudinem circa 3 m, supra laevis. Cotyledones reniformes. Folia adulta lanceolata, non opposita, falcata, 12–22 cm longa, 1·5–2·5 cm lata; nervus intramarginalis plus minusve prominens irregularisque, a margine 2–3 mm remotus; nervi laterales sub angulo circa 15°. Inflorescentiae axillares, 10-24-florae, umbelliformes. Pedunculus complanatus, 20–25 mm longus, 1·0–1·5 mm latus. Pedicellus 5–8 mm longus, gracilis. Alabastra matura glauca circa 5 mm longa, hypanthio obconico, operculo plus minusve apiculato. Fructus globosi, glauci, circa 1·0 cm diametro; valvae 4, raro 5, sed in hypanthio inclusae.

HOLOTYPE: Near head of Tuross R., NW. of Nerrigundah, N.S.W. (Parish of Jillaga, County of Dampier within T.R. 72966), D.J. Hynd NSW 119425, 7.7.1965 (NSW). This material includes two seedlings, one at the cotyledon stage and one a few weeks older. These were grown from seed in 1970 from holotype capsules. ISOTYPES to be distributed to K, CANB.

DISTRIBUTION: NEW SOUTH WALES: This species is known from only four stands totalling about 2·5 hectares (6 acres); (i) one on an exposed ridgetop, (ii) two on western facing slopes, (these three at about 700 m elevation) along the Belimbla Fire Trail, NW. of Nerrigundah, central part of the South Coast Division of N.S.W. and (iii) on "The Scout", a hill further west of localities (i) and (ii) but in the same general area.

Tree up to 12 m high, trunks 20–30 cm diameter at base (habit "Ash-like"). *Bark* rough, fibrous at base to c. 3 m, smooth and whitish above. *Branchlets* markedly angular, strongly glaucous. *Cotyledons* reniform. *Lignotuber* absent. *Juvenile leaves* ovate, slightly glaucous, purple on the undersurface, 3–4 cm long, 2·0–2·5 cm broad. *Intermediate leaves* glaucous, petioles strongly so; 11–16 cm long, 4–6 cm wide; lateral veins at an angle of 35–45° to midrib, intramarginal vein irregular, 3–4 mm from margin. *Adult leaves* lanceolate, falcate, slightly glaucous, 12–22 cm long, 1·5–2·5 cm wide; base slightly oblique; lateral veins at c. 15° to midrib, intramarginal vein not prominent, irregular, 2–3 mm from margin; petiole 1·5–2·5 cm long, terete, shallowly channelled above. *Inflorescences* axillary, 10-24-flowered, umbelliform; peduncle complanate, 20–25 mm long, 1·0–1·5 mm wide, glaucous. *Pedicel* 5–8 mm long, slender. *Mature buds* c. 5 mm long, obconical, operculum about half as long as hypanthium, ± apiculate, glaucous. *Stamens* white, outer filaments antherless; fertile filaments purplish towards base. *Fruit* globular, glaucous, c. 1·0 cm diameter; disc c. 1 mm wide, vertically depressed, staminophore narrow, slightly raised above surface of capsule; orifice c. 4 mm diameter; valves 4 rarely 5, deeply enclosed. *Seeds* large, black, winged.

This species has been named for the very narrow opening to the fruit, a feature not common in the genus. *E. stenostoma* is related to MAKIB *E. fraxinoides* Deane et Maiden, but differs from it in the following, even though the general habit of both is similar:

(i) globular fruits with narrower opening;
(ii) more numerous buds per inflorescence;
(iii) glaucousness of leaves, stems, buds and fruits;
(iv) more acute venation;
(v) lack of insect "scribbles" on the trunk.

MAKID Eucalyptus dendromorpha (*Blakely*) *L. Johnson et D. Blaxell*, stat. nov.

Basionym: *Eucalyptus obtusiflora* DC. var. *dendromorpha* Blakely in Austral. Nat. X (1941) 258.

Holotype: West Albion Park, near Macquarie Pass, N.S.W., R.H. Cambage, 6.1901 (NSW).

Distribution: New South Wales: Chiefly on moist slopes mostly above cliffs on sandstone in the upper Blue Mountains, the Illawarra escarpment, Jamberoo Pass, Fitzroy Falls and the Budawang Range.

This taxon is as distinct from MAKIE *E. obtusiflora* DC., as it is from the other species placed by Pryor and Johnson (1971) in *Eucalyptus* superspecies *Stricta*.

The differences are: (i) broader leaves; (ii) more falcate leaves; (iii) often taller, tree-like form (hence Blakely's varietal epithet); (iv) its occurrence generally on moister, less exposed sites. It also has a tendency to subsessile buds and fruits. However, as with other species in this superspecies, intermediate forms do occur where the various species overlap.

MAKIF Eucalyptus burgessiana *L. Johnson et D. Blaxell*, sp. nov.

Arbuscula multicaulis ("mallee") ad 4 m alta. Cortex laevis griseus. Folia juvenilia non opposita, plus minusve lazulina, ovato-lanceolata, 10–20 cm longa, 3–7 cm lata. Folia adulta non opposita, lanceolata, 10–15 cm longa, 1–2 cm lata. Alabastra matura circa 12 mm longa; hypanthium circa 5 mm longum; operculum circa 3 mm longum, obconicum, apiculatum. Fructus globulari-urceolati, circa 1 cm longi diametroque, pedicello circa 3 mm longo.

Holotype: c. 1 km N. of Great Western Highway, Faulconbridge, Blue Mountains, N.S.W., c. 450 m. alt., L.A.S. Johnson & C. Burgess NSW 132522, 11.3.1953, (NSW). Isotypes to be distributed to K, CANB, MEL.

Distribution: New South Wales: Confined to scattered populations on sandstone ridgetops and plateaux north of the Great Western Highway in the Faulconbridge-Linden area of the Blue Mountains, west of Sydney.

A thin-stemmed, smooth grey-barked mallee up to 4 m high. *Juvenile leaves* not opposite, ovate-lanceolate 10–20 cm long, 3–7 cm broad, not pruinose but with a sub-glaucous appearance in the field; midvein prominent on both surfaces, lateral veins prominent on both surfaces, irregular but forming an angle of c. 45° with the midvein; intramarginal vein 3–5 mm from margin; oil glands relatively large and numerous on both surfaces; petiole slightly flattened, 1·5–2 cm long. *Young twigs* angular and with numerous oil glands presenting a "warty" appearance when dry. *Adult leaves* not opposite, lanceolate, 10–15 cm long, 1–2 cm broad; petioles 1·5–2·5 cm long, flattened; midvein prominent on both surfaces, but lateral and intramarginal veins obscure; apex of leaves often hooked. *Unit inflorescences* 7-flowered, axillary; peduncles flattened, c. 1·5 cm long, c. 3 mm broad. *Mature buds* pedicellate, cylindrical-campanulate. *Pedicel* c. 4 mm long, hypanthium c. 5 mm long, operculum c. 3 mm long, obconical, apiculate. *Buds* (when dry) with a whitish scabrous appearance. *Mature fruits* globular-urceolate, c. 1 cm long and c. 1 cm broad, pedicel c. 3 mm long; operculum scar and staminophore forming the rim of the fruit; disc c. 1 mm wide, depressed at c. 45°; valves 4, just below disc. *Seeds* dark brown, smooth, angular, c. 2 mm long and broad.

The species is named after the Rev. Colin Burgess who first brought it and several other distinct taxa of the genus in the Blue Mountains region to the attention of the senior author.

This species is most closely related to MAKIE *E. obtusiflora* DC. (with which it has been confused in the past) and MAKIG *E. stricta* Sieber ex Spreng. It differs from both these in the size, shape and colour of the juvenile leaves, in habit and in the length of the petiole and peduncle.

MAKIJ **Eucalyptus rupicola** *L. Johnson et D. Blaxell*, **sp. nov.**

Frutex parvus densus multicaulis ("mallee") 0·5–2·0 m altus, 1–4 m diametro, aspectu griseo-lazulino. Folia juvenilia, non opposita, anguste lanceolata, 5–10 cm longa, 0·5–0·7 cm lata. Folia adulta non opposita, anguste lanceolata, 4–7 cm longa, 0·4–0·6 cm lata. Alabastra matura pedicello circa 4 mm. longo; hypanthium circa 5 mm longum; operculum circa 3 mm longum, hemisphaerico-conicum plus minusve apiculatum. Fructus globulari-urceolati circa 7 mm longi diametroque, pedicello 2 mm longo.

HOLOTYPE: Pulpit Rock, 3·2 km north of Blackheath, Blue Mountains, N.S.W., c. 1000 m alt., L.A.S. Johnson NSW 26906, 16.4.1953 (NSW). ISOTYPES to be distributed to K, CANB, MEL.

DISTRIBUTION: NEW SOUTH WALES: Confined to small populations on cliff edges and similar habitats around the rims of the Jamieson, Kedumba, Megalong and Grose Valleys of the upper Blue Mountains west of Sydney, on the eastern part of the Central Tablelands.

A small, dense, many-stemmed shrub of mallee habit, 0·5–2·0 m high, 1–4 m broad. *Stems* erect, smooth-barked, grey-brown in colour. *Leaves* with a bluish appearance (but not pruinose) when young and thus giving the whole plant a bluish cast but becoming green with age. *Juvenile leaves* not opposite, narrow-lanceolate, 5–10 cm long, 0·5–0·7 cm broad, petiole 0·3–0·6 cm long, mid-vein prominent on both surfaces; intramarginal and lateral veins not prominent; adaxial surface with prominent, closely spaced oil glands, producing a scabrous appearance when dry. *Young twigs* also with closely spaced oil glands presenting a "warty" appearance when dry. *Adult leaves* not opposite, narrow lanceolate, shortly petiolate, 4–7 cm long, 0·4–0·6 cm broad, shining, oil glands not prominent, even on drying; surfaces relatively smooth; midvein obscure on adaxial surface, prominent on abaxial surface; intramarginal and lateral veins not prominent; apex of leaf often hooked. *Unit inflorescences* 7-flowered, axillary; peduncles terete, 5–7 mm long. *Mature buds* pedicellate, conical-campanulate; pedicels c. 4 mm long; hypanthium c. 5 mm long; operculum c. 3 mm long, hemispherical-conical, ± apiculate. *Mature fruits* globular-urceolate, c. 7 mm × 7 mm; pedicels c. 2 mm long; operculum scar forming rim of fruit; staminophore slightly below rim; disc c. 1·5 mm wide, depressed, almost vertical.

The specific epithet refers to the distinctive habitat.

This species was first recognized as a distinct taxon by the Rev. Colin Burgess who has an intimate knowledge of the eucalypts of the Blue Mountains.

The species to which *E. rupicola* is most closely related are MAKIG *E. stricta*, MAKIHA *E. apiculata* R.T. Baker et H.G. Smith and MAKIE *E. obtusiflora*. It differs from these by the much smaller fruits and buds. The bluish appearance of the plants is also a distinguishing characteristic.

Plants of *E. rupicola* cultivated in Sydney and Canberra have retained the characteristics of foliage, flowers and fruits, although they rapidly attained a larger stature than in the wild.

Suspected hybrid plants between *E. rupicola* and *E. stricta*, and also between *E. dendromorpha* and *E. rupicola* have been found but they are not common. One specimen (W.F. Blakely, near Weeping Rock, Wentworth Falls, 3.1938) is a suspected hybrid of MAHEQ *E. ligustrina* DC. with *E. rupicola*. No details of bark are available, nor is there a fruiting specimen; however, the leaf and bud characteristics suggest its hybrid origin.

SPEAF **Eucalyptus barberi** *L. Johnson et D. Blaxell*, **sp. nov.**

Arbuscula multicaulis ("mallee") ad 5 m alta. Cortex laevis griseus. Folia adulta lanceolata, non opposita, 6–12 cm longa, 1·5–2 cm lata; petiolus 1–1·5 cm longus, complanatus; nervus intramarginalis prominens, a margine circa 2 mm remotus; nervi laterales sub angulo circa 45°. Rami juniores angulati, vetustiores teretes. Inflorescentiae axillares, 7-florae, umbelliformes. Pedunculus complanatus, 5–15 mm longus, 1–2 mm latus. Alabastra matura circa 10 mm longa, 4–5 mm diametro, pedicellata; hypanthium cylindrico-campanulatum, circa 5 mm longum; operculum conicum circa 3 mm longum, plus minusve apiculatum. Fructus cylindrico-campanulati, pedicellati; valvae 4, raro 5, inclusae.

HOLOTYPE: 7.2 km N. of Cranbrook, eastern Tasmania, L.A.S. Johnson and L.D. Pryor NSW 132523, 1.1965 (NSW). ISOTYPES to be distributed.

DISTRIBUTION: TASMANIA: Confined to granitic rocky ridges in sclerophyllous scrub. Growing with MATEH *E. amygdalina* Labill., MATEG *E. pulchella* Desf., with SPEAB *E. ovata* Labill. nearby. Some hybrids of *E. barberi* and *E. ovata* were found in the area.

A mallee up to 5 m high with smooth grey bark shedding in ribbons. *Cotyledons* reniform, length: breadth ratio of lamina 2: 5. *Juvenile leaves* opposite, narrow ovate to oblong-lanceolate, discolorous, very shortly petiolate; intranodes developing at the eighth pair of leaves; venation prominent, irregular; oil glands large and prominent; stem warty, particularly when dry. *Lignotubers* eventually developed. *Adult leaves* lanceolate, petiolate, slightly falcate, concolorous, not opposite, 6–12 cm long, 1·5–2 cm broad; petiole 1–1·5 cm long, flattened; intramarginal vein prominent, c. 2 mm from the margin; lateral veins not regularly parallel, but c. 45° to the midrib which is conspicuous on both surfaces. *Young shoots* are angular and slightly winged but the older branches are quite terete. *Unit inflorescences* axillary, 7-flowered, umbelliform; peduncle flattened, 5–15 mm long, 1–2 mm broad. *Mature buds* c. 10 mm long, 4–5 mm in diameter. *Pedicel* terete, 3–6 mm long, hypanthium cylindrical to slightly campanulate, c. 5 mm long; operculum conical, c. 3 mm long, ± apiculate. *Fruit* cylindrical to slightly campanulate; valves 4, rarely 5, just below the rim of the fruit; operculum scar on outside edge, narrow; staminophore narrow and forming the rim; disc narrow and inside the rim of the fruit.

The species is named in honour of the late Professor H. Newton Barber whose studies covered a wide field in the genetics, variation and evolution of *Eucalyptus*. He was responsible for bringing this previously unknown species to the attention of Professor L.D. Pryor and the senior author. Barber investigated this species in 1952. He found a tree bearing four years' crops of buds with intact opercula and obviously sterile (Barber 1954).

This species has obvious affinities with *E. ovata*, SPEAA *E. camphora* R.T. Baker and SPEAC *E. yarraensis* Maiden et Cambage and has been grouped near these into the subseries SPEA Ovatinae by Pryor and Johnson (1971).

SPIAF **Eucalyptus sturgissiana** *L. Johnson et D. Blaxell*, **sp. nov.**

Arbuscula paucicaulis ("mallee") ad 4 m alta. Cortex caudicis principalis ramorumque glaucus. Cotyledones bilobi, reniformes. Folia juvenilia in ramis inferioribus persistentia, opposita, sessilia, cordiformia, connata, valde glauca sed tandem viridescentia, 2·5–7·5 cm longa, 1·5–6·5 cm lata. Folia adulta lanceolata, subopposita ad alterna, 4·5–14·5 cm longa, 1·0–2·5 cm lata; nervus intramarginalis non prominens, a margine 1·0 mm remotus; nervi laterales sub angulo circa 30°–40°. Inflorescentiae axillares 7-florae, pedunculo glauco, alabastris capsulisque glaucis. Pedunculus complanatus, 8–10 mm longus, 1·5–3·0 mm latus. Alabastra matura 8–10 mm longa, 5–6 mm diametro, sessilia (flore centrali breviter pedicellata), hypanthio obconico, operculo (interiore) 2–3 mm longo, ± apiculato. Fructus hemisphaerici vel campanulati, glauci; valvae 3, raro 4, in hypanthio inclusae.

Holotype: 29 km by road SW. of Nowra on the Nowra-Braidwood road, N.S.W., L.A.S. Johnson & D.F. Blaxell NSW 119423, 11.8.1970 (NSW). MR 391684 Tianjara 1:50,000 Sheet 9827-I. Isotypes to be distributed to K, CANB, MEL.

Distribution: New South Wales: Confined to small areas of shallow sandy soils with impeded drainage on plateau-like ridges in Permian sandstone country north and east of Sassafras (SW. of Nowra), South Coast and Southern Tablelands. Altitude c. 500 m. Forming pure stands but the individuals sparse within any one population.

A few stemmed (3–6) *mallee* up to 4 m high. Main trunks bare of branches for $\frac{1}{3}$ to $\frac{1}{2}$ their height, then with slender, opposite branches of much less diameter than the main stems. *Bark* at first glaucous but when shed exposing smooth grey-brown bark towards the base. Bark densely glaucous on upper trunk and branches. *Cotyledons* bilobed, reniform. *Juvenile leaves* opposite, sessile, cordiform, connate, glaucous when young, but less so with age, 2·5–7·5 cm long, 1·5–6·5 cm wide; major intramarginal vein ± prominent, 3–4 mm from edge of leaf. *Adult leaves* lanceolate, subopposite to alternate, 4·5–14·5 cm long, 1·0–2·5 cm wide; petioles short, 5–12 mm long, 3–5 mm wide, flattened, winged; lateral veins at 30°–40° to mid-vein; one prominent oil gland per vein islet. *Young branches* markedly ridged longitudinally, terete when older. *Inflorescences* axillary, 7-flowered, peduncle, buds and fruits glaucous; peduncle flattened, 8–10 mm long, 1·5–3·0 mm broad. *Mature buds* 8–10 mm long, 5–6 mm diam., sessile (the middle bud often shortly pedicellate). *Hypanthium* obconical, inner operculum shorter ($\frac{1}{3}$–$\frac{1}{2}$) than hypanthium, ± apiculate. *Calycine operculum* shed well before anthesis (present on the Holotype material). *Fruit* hemispherical to campanulate, sessile or shortly pedicellate, glaucous; valves 3, seldom 4, their tips lower than the staminophore.

This species is named in honour of Major Jim Sturgiss of Sassafras who discovered most of the known populations and who sent material to this Herbarium on several occasions.

E. sturgissiana is a very distinctive species which appears to be most closely related to SPIAC *E. kitsoniana* Maiden and SPIAA *E. neglecta* Maiden, which are also small trees of restricted distribution, but both endemic in Victoria.

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Annotated Bibliography of Floristic Lists of New South Wales

John Pickard

SUMMARY

Two hundred and forty-three papers, which included, *inter alia*, floristic lists, were found in a search through twenty-eight periodicals. A number of non-periodical and unpublished sources were also scanned. Brief notes indicate the scope of each list and its locality. The papers are keyed to the botanical subdivisions of New South Wales, so that any lists relevant to an area can be readily located.

INTRODUCTION

During the course of reconnaissance ecological surveys the need for floristic lists of the areas under examination became apparent. As the most recent census of New South Wales plants (Maiden and Betche 1916) is out-of-date and contains no notes on intra-state distributions of the species, a literature search was undertaken. Any paper containing a floristic list or notes on the flora of a region within New South Wales, Lord Howe Island and the Australian Capital Territory was included. The main object was to find and tabulate all the papers with complete floristic lists and ecological notes on the environment and vegetation. However, the latter requirements were too stringent, since many lists contained virtually no notes.

Certain types of papers were not scanned and are not included. These are primarily of a taxonomic nature where the mode of entry to distributions is via the taxa rather than the locality.

TYPES OF FLORISTIC LISTS

In terms of completeness and taxonomic correctness, the quality of the lists varies considerably. The most detailed are included in regional floras or ecological surveys e.g. Beadle *et al.* (1962), Costin (1954), and Moore (1953a, 1953b). The least detailed are usually simply short lists of predominant species or notes in the text about excursions to different areas, e.g. Crispo (1923), Dally (1960) and Gilbert (1947). The majority of the lists fall between these extremes.

The problem of correctness of taxonomic determination is quite real and the source of the identifications is unknown in most cases. Allied to this are changes in nomenclature. Many of the lists are 50 years old and some taxa have undergone more than one name change, e.g. *Argyrodendron* in Baur (1957). In general, the nomenclature used in the original paper is used in the notes in this bibliography e.g. *Angophora lanceolata* in Davis (1941a); *Eucalyptus goniocalyx* and *E. haemastoma* var. *micrantha* in McLuckie and Petrie (1926).

PAPERS NOT INCLUDED

There are numerous papers which make passing reference to the predominant plants of an area. Typical examples may be found in CSIRO Australia Soils and Land Use Series. These were scanned but no papers have been tabulated in this bibliography, because the scope was too broad.

UNPUBLISHED FLORISTIC LISTS

Many government departments and instrumentalities, as well as universities have unpublished floristic lists that were compiled for specific purposes. For example, the Forestry Commission of New South Wales has, on file, innumerable check-lists and inventories of State Forests and parts of State Forests. In general, these sources have not been investigated for this bibliography. Exceptions have been made with unpublished lists held in the Library of the Royal Botanic Gardens, Sydney, abbreviated as RBG. Lib.

JOURNALS SEARCHED

Twenty-eight periodicals and a number of non-periodicals were scanned. In some cases, e.g. Ecological Monographs, Commonwealth Forestry and Timber Bureau Bulletin and CSIRO Soils Publications, no papers fitting the terms of reference were found. These journals are included in the following list being indicated by an asterisk (*). However, as mentioned above, they may contain papers with passing reference to the predominant flora:

Australian Forestry.
*Australian Forest Research.
*Australian Journal of Biological Sciences.
Australian Journal of Botany.
*Australian Journal of Marine and Fresh Water Research.
Australian Naturalist.
Australian Plants.
Australian Wild Life.
*Australian Wild Life: Newsletter.
*Commonwealth Forestry and Timber Bureau Bulletin.
Contributions from the New South Wales National Herbarium.
*CSIRO Australia Bulletin.
CSIRO Australia Division of Plant Industry Technical Paper.
CSIRO Australia Land Research Series.
*CSIRO Australia Soils and Land Use Series.
*CSIRO Australia Soils Publication.
CSIRO Australia Wildlife Research.
Cycad.
*Ecological Monographs.
*Ecology.
*Forestry Commission of New South Wales Research Notes.

Journal and Proceedings of the Royal Society of New South Wales.
*Journal of Applied Ecology.
Journal of Ecology.
Journal of the Soil Conservation Service of New South Wales.
Proceedings of the Ecological Society of Australia.
Proceedings of the Linnean Society of New South Wales.
The Orchadian.
Victorian Naturalist.

USE OF THE BIBLIOGRAPHY

The papers are arranged alphabetically according to authors and chronologically within each author. Table 1 lists the numbers of the papers that are relevant to the subdivisions of the State recognized at the National Herbarium of New South Wales. (See Contrib. N.S.W. Nat. Herb. Fl. N.S.W. Nos. 1–18 or Anderson, R.H. (1968).—The Trees of New South Wales (Govt Printer: Sydney) 4th Ed.).

Because of the varying quality of the lists and the different sizes of the areas covered, no attempt had been made to indicate "major" lists.

The mode of entry into the bibliography is via table 1. For example, if the reader is interested in the flora of the North Coast then papers 12, 15, 19, 20, 37, 66, 67, 68 . . . would be relevant. Further geographical breakdown may be made using the notes on location with each reference.

TABLE 1

Numerical list of references according to botanical subdivisions.

Lord Howe Island:	104, 117, 131, 132, 138, 139, 162.
North Coast:	12, 15, 19, 20, 37, 66, 67, 68, 77, 91, 91a, 94, 95, 96, 98, 121, 126, 127, 128, 130, 152, 163, 181, 184, 185, 186, 187, 188, 189, 190, 192, 193, 197, 199, 202, 203, 204, 205, 215, 218, 224, 225, 228, 229, 233.
Central Coast:	5, 6, 7, 13, 14, 18, 22, 23, 26, 28, 38, 39, 53, 54, 57, 58, 60, 62, 63, 70, 71, 72, 73, 78, 79, 81, 82, 83, 84, 85, 87, 89, 90, 105, 106, 107, 108, 112, 113, 125, 137, 144, 145, 146, 147, 161, 165, 167, 168, 169, 170, 171, 172, 176, 177, 183, 199, 201, 203, 204, 216, 219, 233, 234, 235, 236, 237, 238, 239, 242, 243.
South Coast:	142, 160, 206, 233.
Northern Tablelands:	9, 19, 35, 48, 51, 55, 69, 94, 95, 96, 102, 153, 154, 155, 182, 191, 203, 204, 211, 215, 217, 226, 230.
Central Tablelands:	8, 19, 29, 38, 46, 50, 53, 54, 64, 65, 100, 106, 111, 118, 120, 134, 148, 151, 164, 166, 203, 204, 207, 210, 241.
Southern Tablelands:	10, 11, 17, 31, 32, 33, 34, 36, 47, 52, 56, 61, 76, 97, 99, 103, 116, 124, 129, 133, 143, 149, 174, 175, 201a, 206, 221.
North Western Slopes:	48, 51, 55, 86, 119, 136, 141, 159, 179, 180, 194, 195, 199, 214.
Central Western Slopes:	1, 2, 3, 16, 24, 30, 43, 44, 45, 46, 49, 88, 100, 109, 110, 200, 203, 204.
South Western Slopes:	45, 47, 92, 93, 99, 143, 157, 158, 231, 232.
Western Plains:	21, 27, 40, 41, 42, 43, 59, 92, 93, 114, 115, 122, 123, 159, 178, 208, 212, 213, 214, 222, 223.
Far Western Plains:	21, 74, 75, 92, 93, 123, 173, 208, 212.
N.S.W. General:	4, 25, 80, 101, 135, 140, 150, 156, 196, 198, 199, 209, 220, 227, 240.

FLORISTIC LISTS OF NEW SOUTH WALES

1. Althofer, G.W. (1943).—Goonoo forest—floral wonderland. Vict. Nat. 60: 45–46.

Discussion of the flora, without a list of species.

Located between Dubbo and Mendooran.

2. Althofer, G.W. (1946).—Orchids of the Dripstone-Wellington-Gulgong district (Central-western slopes, N.S.W.). Vict. Nat. 63: 101–103.

List with notes.

3. Althofer, G.W. (1956).—Census of plant species endemic on area of ground at Dubbo given by Forestry Commission to Australian National Arboretum. Austral. Wild Life 3 (1): 41–42.

With notes.

4. Anderson, R.H. (1939).—The naturalised flora of New South Wales (excluding Gramineae). Contrib. N.S.W. Nat. Herb. 1: 16–33.

Species listed under families, country of origin stated.

5. Anon. (1910).—Trip to Penshurst. Austral. Nat. 2: 6–7.

Short list of species seen in an area which is now an older suburb of Sydney.

6. Anon. (1960).—Malabar outing on November 1st, 1959. Austral. Nat. 12 (1): 16.

List only, no notes about exact locality but probably on sandstone; coastal suburb of Sydney.

7. Anon. (no date, probably 1962).—A handbook for visitors to the Barren Grounds Faunal Reserve No. 3. (Fauna Protection Panel: Sydney).

A brief guide to the Reserve including a comprehensive floristic list. Species are listed under families and common names are cited. No ecological notes are included. A sketch map of the Reserve is included.

Located 24 km (15 miles) east of Robertson.

8. Anon. (no date).—Flora and fauna of the Blue Mountains, N.S.W. (Municipality of Katoomba: 24 pp.)

Species listed under localities—generally tourist attractions. Notes on habitat.

9. Anon. (no date but *c.* Dec. 1915).—Indigenous flora of Barrington Tops. (Unpub. 15 pp. MS in RBG. Lib.).

Species listed under families, no notes.

10. Anon. (no date).—List of plants growing at The Creal and in the Monaro district. (Unpub. 2 pp. MS. in RBG. Lib.).

List of introduced plants, probably in a guest-house garden. The Creel is now flooded by Lake Jindabyne.

11. Anon. (no date).—Kosciusko flora. (Unpub. 9 pp. MS. in RBG. Lib.).

Dicotyledons 6 pp., Monocotyledons 3 pp.

Species listed under families, with altitudinal range.

12. Anon. (no date.)—Trees, shrubs and climbers collected at various times in the Acacia Creek-Tooloom-Killarney District, Northern N.S.W. (Unpub. 10 pp. MS. in RBG. Lib.).

Species arranged in families.

13. ANZAAS (1952).—Kuring-gai Chase-Church Point-Long Reef. Mimeo notes for Excursion No. 23. ANZAAS Meeting Sydney Aug. 1952.

Species lists for five localities:

Sorlie laterite, McCarrs Creek sandstone, McCarrs Creek brush forest, Bayview mangroves and saltmarsh and Dee Why Lagoon. Map included. Located between Sydney and Broken Bay.

14. ANZAAS (1962).—Excursion No. 24: Sorlie-Kuringai Chase-Dee Why. Notes on the route. (18 pp. mimeo.).

Lists from Sorlie laterite, McCarrs Creek sandstone, McCarrs Creek rainforest and McCarrs Creek mangroves and saltmarsh. Map included. Located between Sydney and Broken Bay.

15. Archer, L.W. (1964).—The orchids of northern N.S.W. The Orchadian 1: 51.

List of species and hybrids between Macleay River and Queensland border.

16. Baker, R.T. (1896).—On the botany of the Rylstone and Goulburn River districts. I. Proc. Linn. Soc. N.S.W. 21: 427–466.

Floristic list with notes on most species.

17. Barrow, M.D., Costin, A.B., and Lake, P. (1968).—Cyclical changes in an Australian fjaeldmark community. J. Ecol. 56: 89–96.

List of main vascular species present in *Epacris petrophila* fjaeldmark in Mt Kosciusko area.

18. Barwick, A.C. (1903).—The botany of the "clears" and "basalt masses", County of Hunter, N.S. Wales. Proc. Linn. Soc. N.S.W. 28: 932–943.

Annotated list of species observed on some of the breccia necks and basalt caps as well as on the surrounding sandstone in the Putty district.

19. Baur, G.N. (1954).—Factors affecting rainforest distribution in New South Wales. (Unpub. B.Sc. Hons. Thesis Syd. Univ.).

Includes lists of species from the following locations:

Upper Hastings River
Mt Wilson (Blue Mountains)
Myall Lakes (16 km (10 miles) E. of Buladelah)
Barrington—temperatre rain forest
Barrington—subtropical rain forest
Bulli (8·1 km (5 miles) N. of Wollongong)
Loddon Falls (4·8 km (3 miles) NW. of Bulli)
Bola Creek (Royal National Park, 32·2 km (20 miles) S. of Sydney)
Moore Park, Kyogle (Richmond River 32·2 km (20 miles) NW. of Kyogle)
Unumgar State Forest (14·5 km (9 miles) NE. of Urbenville)
Koreelah Rd (Upper Clarence River valley)

Mt Lindesay—tropical rain forest (Queensland border)
Mt Lindesay—montane rain forest (Queensland border)
Wiangarie State Forest (16 km (10 miles) N. of Kyogle)
Lynches Creek (16 km (10 miles) N. of Kyogle)
Whian Whian—coachwood forest (16 km (10 miles) SW. of Mullumbimby)
Whian Whian—upper basalt (16 km (10 miles) SW. of Mullumbimby)
Whian Whian—lower basalt (16 km (10 miles) SW. of Mullumbimby)
Mt Pikapene—dry rainforest (38·6 km (24 miles) SW. of Casino)
Mt Pikapene—creek bank forest (38·6 km (24 miles) SW. of Casino)
Myrtle Creek (32·2 km (20 miles) SE. of Mt. Pikapene)
McCauleys Headland (3·2 km (2 miles) N. of Coffs Harbour)
Bruxner Park (immediately N. of Coffs Harbour)
Brooklana (16 km (10 miles) E. of Dorrigo)
Orara West S.F. (17·7 km (11 miles) W. of Coffs Harbour)
Clouds Creek S.F.—basalt (24·1 km (15 miles) NNW. of Dorrigo)
Clouds Creek S.F.—gully (24·1 km (15 miles) NNW. of Dorrigo)
Moonpar S.F. (16 km (10 miles) NNW. of Dorrigo)
Dome Mountain (16 km (10 miles) E. of Urbenville)
Pine Creek S.F.—beach sand (16 km (10 miles) SSW. of Coffs Harbour)
Pine Creek S.F.—gully (16 km (10 miles) SSW. of Coffs Harbour)

Exact locations are given in the text.

20. Baur, G.N. (1957).—Nature and distribution of rain forests in N.S.W. Austral. J. Bot. 5: 190–234.

Species list from six localities on the North Coast. The localities, subformations and alliances or associations are: Moore Park ("gallery", *Castanospermum australe* alliance) Tooloom Plateau (tropical, *Dysoxylum fraseranum* association of *Argyrodendron* spp. alliance), Wiangarie State Forest (tropical, *Argyrodendron* association of *Argyrodendron* spp. alliance), Mt Pikapene State Forest (dry, *Hemicyclia australasica* alliance), Bruxner Park (subtropical, *Sloanea woollsii* association of *Ceratopetalum apetalum* alliance), Moonpar State Forest (*Ceratopetalum—Schizomeria* association of *Ceratopetalum apetalum* alliance).

21. Beadle, N.C.W. (1948).—The Vegetation and Pastures of Western New South Wales with special reference to soil erosion. (Govt. Printer: Sydney).

Species are listed for each of the 18 associations recognized (equivalent to recent Australian authors' alliances). Only grasses and forbs are included in most floristic lists. The lists are subdivided according to growth form and fodder value. Tree, small tree and shrub species are not listed but noted *inter alia* in the text.

22. Beadle, N.C.W., Evans, O.D. and Carolin, R.C. (1963).—Handbook of the Vascular Plants of the Sydney District and Blue Mountains. (Beadle N.C.W., Evans, O.D., Carolin, R.C. and M.D. Tindale: Armidale).

Keys to all species, notes on habitats. Common names.

23. Benn, B. and McKern, J.G. (1966).—Notes on the vascular plants of the Uloola Track. The Royal National Park. Austral. Wild Life 5 (1): 4–30.

Species arranged in families, divided into localities. With maps. Located immediately south of Sydney.

24. Biddiscombe, E.F. (1963).—A vegetation survey in the Macquarie region, New South Wales. CSIRO Austral. Div. Plant Ind. Tech. Pap. 18.

Appendix 1. Species lists for some vegetation associations of the Macquarie region, N.S.W. Species listed under families for each of the twenty-two associations recognized. Eleven alliances in six subformations (dry sclerophyll forest, swamp sclerophyll forest and savanna woodland, tall woodland, shrub woodland, dry mallee and dry tussock grassland) are recognized. With maps. Located north of Dubbo.

25. Blakely, W.F. (1965).—A Key to the Eucalypts. 3rd Ed. (Forestry and Timber Bureau: Canberra).

Includes a table, on p. 305, listing species found in N.S.W.

26. Bradley, J. and Nathan, C.V. (1965).—Indigenous plants recorded at Ashton Park area, January 1965. Wild Life Preservation Soc. Aust. Newsletter March 1965, No. 13: 7.

List of species, in families, from the Bradleys Head reserve, Port Jackson.

27. Braithwaite, L.W. and Frith, H.J. (1969).—Waterfowl in an inland swamp in New South Wales. I. Habitat. CSIRO Austral. Wildlife Res. 14: 1–16.

Cumbungi (*Typha* spp.) swamp at Barrenbox, 19·3 km (12 miles) NW. of Griffith.

List of species with notes on vegetation in text.

28. Bronson, D. (1960).—Orchids of the Gosford District. Cycad 1 (2): 9–10.

Species listed in the text with notes.

29. Brough, P., McLuckie, J. and Petrie, A.H.K. (1924).—An ecological study of the flora of Mount Wilson. I. The vegetation of the basalt. Proc. Linn. Soc. N.S.W. 49: 475–498.

Species are listed for five associations: *Ceratopetalum—Doryphora*, *Eucalyptus — Doryphora*, *Eucalyptus — Alsophila*, *Eucalyptus — Pteridium*, western slopes; and roadside. Qualitative estimates of abundance are listed. With map.

30. Bryant, W.G. (1962).—An annotated list of naturalised and indigenous Gramineae of the upper Hunter region, N.S.W. J. Soil Cons. Serv. N.S.W. 18: 67–77.

As in title.

31. Burbidge, N.T. (1961).—The wattles of the Australian Capital Territory. 1st Ed. (Verity Hewitt: Canberra).

See Burbidge (1967).

32. Burbidge, N.T. (1963).—The gum trees of the Australian Capital Territory. (N.T. Burbidge: Canberra).

Includes list with notes on distribution and habitat.

33. Burbidge, N.T. (1966).—Australian Grasses. Vol. 1: Australian Capital Territory and Southern Tablelands of New South Wales. (Angus and Robertson: Sydney).

Descriptions and notes on the predominant grasses of the area.

34. Burbidge, N.T. (1967).—The wattles of the Australian Capital Territory. Revised edition. (N.T. Burbidge: Canberra).

List with notes on distribution and habitat.

35. Burbidge, N.T. (1968).—Australian Grasses. Vol. 2: Northern Tablelands of New South Wales. (Angus and Robertson: Sydney).

Descriptions and notes on the predominant grasses in the region.

36. Burbidge, N.T. and Gray, M. (1965).—The plants of the Australian Capital Territory. CSIRO Austral. Div. Plant Ind. Tech. Pap. 21.

Keys to generic level and to specific level in some cases. Notes on habitats.

37. Burges, A. and Johnston, R.D. (1953).—The structure of a New South Wales subtropical rain forest. J. Ecol. 41: 72–83.

Located about 80·5 km (50 miles) W. of Wauchope in *Ceratopetalum apetalum* rain forest.

Table 1 lists species recorded from transect: angiosperms, pteridophytes and broyphytes.

38. Burgess, C. (1963).—Blue Mountain Gums. (Wild Life Preservation Society of Australia: Sydney).

A guide to the eucalypts and angophoras of the Blue Mtns.

39. Cady, L. (1960).—Orchids of the Illawarra district. Austral. Nat. 12 (1): 11–15.

Listed under tribes and sections, common names, flowering dates and notes on habitat and localities. Map on p. 8. Located immediately south of Wollongong.

40. Cambage, R.H. (1900a).—Notes on the botany of the interior of New South Wales. I. From the Darling River at Bourke to Cobar. Proc. Linn. Soc. N.S.W. 25: 591–604.

Notes on the flora and vegetation with lists of species. For map see Cambage (1902b).

41. Cambage, R.H. (1900b).—Notes on the botany of the interior of New South Wales. II. From Cobar to the Bogan River above Nyngan. Proc. Linn. Soc. N.S.W. 25: 708–720.

Notes on the flora and vegetation. For map see Cambage (1902b).

42. Cambage, R.H. (1901a).—Notes on the botany of the interior of New South Wales. III. Mudall Station on the Bogan River to Euabalong on the Lachlan River. Proc. Linn. Soc. N.S.W. 26: 197–214.

Notes on the flora with interspersed floristic lists. For map see Cambage (1902b).

43. Cambage, R.H. (1901b).—Notes on the botany of the interior of New South Wales. IV. Mt. Hope to Parkes. Proc. Linn. Soc. N.S.W. 26: 317–333.

Notes on the flora with interspersed floristic lists. For map see Cambage (1902b).

44. Cambage, R.H. (1901c).—Notes on the botany of the interior of New South Wales. V. From Parkes to Marsden. Proc. Linn. Soc. N.S.W. 26: 685–699.

Notes on the flora with interspersed floristic lists. For map see Cambage (1902b).

45. Cambage, R.H. (1902a).—Notes on the botany of the interior of New South Wales. VI. From Marsden to Narrandera. Proc. Linn. Soc. N.S.W. 27: 186–206.

No list but species recorded under different localities with notes. For map see Cambage (1902b).

46. Cambage, R.H. (1902b).—Notes on the botany of the interior of New South Wales. VII. From Forbes to Bathurst. Proc. Linn. Soc. N.S.W. 27: 561–593.

No list but species noted under various localities. With notes and map.

47. Cambage, R.H. (1904a).—Notes on the native flora of New South Wales. I. The Tumbarumba and Tumut districts. Proc. Linn. Soc. N.S.W. 29: 685–698.

Brief notes with short lists.

48. Cambage, R.H. (1904b).—Notes on the native flora of New South Wales. II. Western slopes of New England. Proc. Linn. Soc. N.S.W. 29: 781–797.

Notes on species and brief lists.

49. Cambage, R.H. (1905).—Notes on the native flora of New South Wales. III. Orange to Dubbo and Gilgandra. Proc. Linn. Soc. N.S.W. 30: 203–224.

Species noted for various localities with complete list of all eucalypts.

50. Cambage, R.H. (1906).—Notes on the native flora of New South Wales. V. Bowral to the Wombeyan Caves. Proc. Linn. Soc. N.S.W. 31: 432–452.

Species listed, with notes, under the following localities:
Bowral—22 miles post,
Bullio—Wombeyan Caves,
Wombeyan Caves limestone,
Wombeyan Caves-Taralga Road.
Also complete list of eucalypts recorded.

51. Cambage, R.H. (1908).—Notes on the native flora of New South Wales. VI. Deepwater to Torrington and Emmaville. Proc. Linn. Soc. N.S.W. 33: 45–66.

With map. Species listed under the following localities:
Deepwater-Stannum,
Stannum and Torrington,
Torrington-Emmaville,
Emmaville,
Tent Hill-Deepwater.

52. Cambage, R.H. (1909).—Notes on the native flora of New South Wales. VII. Eastern Monaro. Proc. Linn. Soc. N.S.W. 34: 310–336.

With map. Species listed under the following localities:
Cooma,
Cooma-Cootralantra,
Cooma-Nimmitabel,

Nimmitabel-Kybean River and Kydra Mountain,

Cooma-Cowra Creek and Macanally.

Supplementary complete list of *Acacia* and *Eucalyptus* species recorded. Notes given on some species.

53. Cambage, R.H. (1911).—Notes on the native flora of New South Wales. VIII. Camden to Burragorang and Mount Werong. Proc. Linn. Soc. N.S.W. 36: 541–583.

With map of route. Species grouped in families under the following localities:

Camden-Burragorang,

Burragorang-Yerranderie and Kowmung,

Colong-Mt Werong.

Notes on many of the species.

54. Cambage, R.H. (1912a).—Notes on the native flora of New South Wales. Supplementary lists to Part VIII, Camden to Burragorang and Mount Werong. Proc. Linn. Soc. N.S.W. 37: 617–621.

As in title with scanty ecological notes.

55. Cambage, R.H. (1912b).—Notes on the native flora of New South Wales. IX. Barraba to Nandewar Mountains and Boggabri. Proc. Linn. Soc. N.S.W. 37: 622–651.

With map of route. Species recorded from the following localities:

Barraba-May Vale,

Nandewar Mountains (May Vale-Mt Kaputar),

Maules Creek-Boggabri,

Tangulda (Barbers Pinnacle).

56. Cambage, R.H. (1918).—Notes on the native flora of New South Wales. X. The Federal Capital Territory. Proc. Linn. Soc. N.S.W. 43: 673–711.

With map showing route. Notes on various species and floristic list with common names.

57. Cambage, R.H. (1923).—Plant invasion of a denuded area. J. & Proc. Roy. Soc. N.S.W. 57: 334–336.

List of species occurring five years after excavation of a borrow pit on Hawkesbury sandstone near Yanderra, north-east of Mittagong.

58. Cambage, R.H. (1924).—Landslides near Picton and notes on the local vegetation. J. & Proc. Roy. Soc. N.S.W. 55: 207–212.

Brief notes on the dominant tree flora of the Razorback Range; no list.

59. Cambage, R.H. (1926).—Notes on the native flora of New South Wales. XI. Moree to Mungundi and Moonie River—with a description of a new species of *Eucalyptus*. Proc. Linn. Soc. N.S.W. 51: 315–326.

List of plants noticed on roadside. Notes on some species. With map.

60. Carne, W.M. (1910).—Note on the occurrence of a limestone flora at Grose Vale. Proc. Linn. Soc. N.S.W. 35: 849–858.

Species list, arranged by family. Located on eastern slopes of Blue Mountains in an area of sandstone and shale.

61. Carter, C.E. (1946).—Eucalypts of the Australian Capital Territory. Vict. Nat. 63: 167.

List with locations.

62. Cheel, E. (1912).—Notes on the flora collected during the Easter excursion: Lake Illawarra, Mt. Kembla and Gooseberry Island. Austral. Nat. 2: 145–147.

Short notes from these localities. No lists. Located immediately south of Wollongong.

63. Cheel, E. (1945).—A list of plants in the "Muogamarra" (Private) Sanctuary. (mimeo by Australian Bushland Conservation Assoc. Inc., Sydney).

List with common names from an area of Hawkesbury Sandstone, near Broken Bay, now included in Muogamarra Nature Reserve No. 15.

64. Chisholm, E.C. (1923).—The flora of Marrangaroo, County of Cook. Austral. Nat. 5: 122–129.

Species arranged in families. In the vicinity of Lithgow, with map.

65. Chisholm, E.C. (1924).—Eucalypts of the Blue Mountains and their defined areas. Proc. Linn. Soc. N.S.W. 49: 147–150.

List of species and notes on localities. Listed under species and then under localities, with qualitative frequency.

66. Chisholm, E.C. (1925).—The Comboyne Plateau. Its general conformation and flora. Proc. Linn. Soc. N.S.W. 50: 284–298.

67. Chisholm, E.C. (1927).—Additional flora of the Comboyne Plateau, 1926. Proc. Linn. Soc. N.S.W. 52: 378–379.

68. Chisholm, E.C. (1937).—Final additions to the flora of the Comboyne Plateau. Proc. Linn. Soc. N.S.W. 62: 65–72.

Species arranged in families, with notes on habitats. Some identifications seem doubtful. Located west of Wauchope, map in Chisholm (1925).

69. Christie, W. (1877).—The forest vegetation of central and northern New England in connection with geological influences. J. & Proc. Roy. Soc. N.S.W. 11: 21–39.

No list but of historical value.

70. Clarke, L.D. and Hannon, N.J. (1967).—The mangrove swamp and salt marsh communities of the Sydney district. I. Vegetation, soils and climate. J. Ecol. 55: 753–771.

Notes on list of dominant species.

71. Cleland, J.B. (1924).—List of plants growing upon Milson Island, Hawkesbury River. Bur. Microbiol. 3rd Rept.: 218–225.

Arranged according to families, with notes on growth habits, frequency and habitat. Hawkesbury Sandstone island, near Brooklyn.

72. Collie, R. (1887).—The influence of bush fires in the distribution of species. J. & Proc. Roy. Soc. N.S.W. 21: 103–110.

No location is cited but it appears to be in the vicinity of Sydney on Hawkesbury or Narrabeen sandstone.

73. Collins, M.I. (1921).—On the mangrove and saltmarsh vegetation near Sydney, with special reference to Cabbage Tree Creek, Port Hacking. Proc. Linn. Soc. N.S.W. 46: 376–392.

Ecological notes and list of species.

74. Collins, M.I. (1923).—Studies in the vegetation of arid and semiarid New South Wales. I. The plant ecology of the Barrier district. Proc. Linn. Soc. N.S.W. 48: 229–266.

Species listed according to ecological and physiographical habitats: rocky hills and slopes; plains and clay-pans; crab-holes (gilgais) and flooded flats. Notes on other habitats include, *inter alia*, names of dominant species. Located near Broken Hill.

75. Collins, M.I. (1924).—Studies in the vegetation of arid and semi-arid New South Wales. II. The botanical features of the Grey Range and its neighbourhood. Proc. Linn. Soc. N.S.W. 49: 1–18.

Ecological notes on the habitats and flora. Species list from Grey Range. Located near Broken Hill.

76. Costin, A.B. (1954).—A Study of the Ecosystems of the Monaro Region of New South Wales with special reference to soil erosion. (Govt. Printer: Sydney).

Ecological survey of approximately 6,000 sq. miles. Floristic lists are tabulated for each of the twenty-five alliances recognized. Ten formations and fifteen subformations are represented: Grassland (sod tussock, wet tussock, dry tussock), alpine herbfield (short, tall), fen, bog (raised, valley), fjaeldmark, heath, scrub (wet, dry), mallee (wet), woodland (savanna, tall, subalpine) and sclerophyll forest (wet, dry). Appendix B, table 140, tabulates the native flora by alliances and table 141 tabulates the naturalized flora by alliances. Regional distribution, predominant life-form and geographical element are cited.

77. Cousins, J.C. comp. (no date, 1950's).—Bellangry herbarium register (N.S.W. For. Comm.) (Unpub. mimeo.).

List of species in the herbarium of Bellangry State Forest, Hastings River, with notes on habitats and growth form.

78. Coveny, R.G. (1969).—Check list the plants of Royal National Park. (Unpub. 13 pp. MS. held in RBG. Lib.).

Species listed alphabetically, no locations, no notes. Located immediately south of Sydney.

79. Crispo, H.M. (1923).—Excursion to Balgowlah. Austral. Nat. 5: 79–80.

Short list of species from a coastal area which is now a suburb of Sydney.

80. Cross, D.O. and Vickery, J.W. (1950).—List of the naturalised grasses in New South Wales. Contrib. N.S.W. Nat. Herb. 1: 275–280.

Listed alphabetically within genera. Common names and country of origin.

81. Dally, E.T. (1960).—Our local trees. Cycad 1 (2): 8–9.

List of the commonest species in Gosford district.

82. Davis, C. (1936).—Plant ecology of the Bulli district. I: Stratigraphy, physiography and climate; general distribution of plant communities and interpretation. Proc. Linn. Soc. N.S.W. 61: 285–297.

83. Davis, C. (1941a).—Plant ecology of the Bulli district. II: Plant communities of the plateau and scarp. Proc. Linn. Soc. N.S.W. 66: 1–19.

84. Davis, C. (1941b).—Plant ecology of the Bulli district. III: Plant communities of the coastal slopes and plain. Proc. Linn. Soc. N.S.W. 66: 20–32.

Floristic lists, in parts II and III, of the vegetation associations and habitats recognized:

Part II

Eucalyptus Sieberiana association and variants,

brush at Loddon Falls,

moist lithosere on Hawkesbury sandstone,

swamp or moor communities,

vegetation of the scarp,

Angophora lanceolata facies of *E. piperita* association,

E. piperita association,

E. saligna association.

Part III

E. pilularis association,

brush (subtropical rain forest),

shrub-dune community of sand dune succession,

E. botryoides—Banksia integrifolia associes of sand dune succession,

climax of subsaline lagoon succession,

sea-cliff vegetation.

Notes on these communities also include other species.

Located immediately north of Wollongong.

85. Davis, C., Day, M.F. and Waterhouse, D.F. (1938).—Notes on the terrestial ecology of the Five Islands. I. Proc. Linn. Soc. N.S.W. 63: 357–388.

No other parts of this proposed series were published. Ecological notes on the vegetation and detailed floristic lists. Species are arranged according to habitats with qualitative frequency on each island. Brief notes are appended for each species, life forms and life form spectra are also recorded. Annotated aerial photographs are included. Located off Port Kembla.

86. Dinning, D.M. (1956).—Preliminary study of the ecology of the Warialda sandstone. (Unpub. B.Sc. Hons. thesis Univ. of New England).

Includes floristic list from the area studied. Located in the immediate vicinity of Warialda.

87. Dobbin, D. (1962).—Flora observed at The Sphinx, Ku-ring-gai Chase, October 1961. Austral. Nat. 12 (3): 4.

Listed by family.

88. Dwyer, J.W. (1918–21).—A floral survey of the south-western slopes of N.S. Wales round about Temora and Barmedman. Austral. Nat. 4: 212–224.

List with some annotations on habitat.

89. Evans, O.D. (1959).—A census of trees and plants in Kuring-gai Chase. (Unpub. 17 pp. roneo in RBG. Lib.)

Species arranged in families with notes on locality, habitat and growth form. Copy in RBG. Lib. with hand-written additions.

90. Evans, O.D. (1963).—Species list *in* Hannon, N.J. (1963).—The regeneration of plant cover on a denuded sandstone area. Proc. Linn. Soc. N.S.W. 88: 47–53.

List of species with annotations as to micro-location.

Compared with list compiled by Cambage (1923).

Located at Yanderra, north-east of Mittagong.

91. Floyd, A.G. (1966).—Effect of fire upon weed seeds in the wet sclerophyll forests of northern New South Wales. Austral. J. Bot. 14: 243–256.

List of species undesirable for forestry operations near Coffs Harbour.

91a. Floyd, A.G. (1966).—Oakes State Forest. Slopes of Mt. Killicrankie. (unpub. 2 pp. MS. in RBG. Lib.)

Short list of rainforest species recorded by H.C. Hayes and D.J. McGillivray on Mt Killicrankie, approximately 32·2 km (20 miles) west of Bowraville.

92. Forestry Commission of N.S.W. (1951–52).—Forest flora along the open road, Riverina Forestry District.

Unpub. mimeo in a series of unnumbered parts: Wagga Sub-District, Mildura Sub-District, Corowa Sub-District, Narrandera Sub-District, Griffith Sub-District. Prepared by G.A. Withers 1951–52. Species arranged in order of occurrence along various roads within the sub-districts, mileages from towns serve as locality records.

93. Forestry Commission of N.S.W. (no date).—Flora survey. Riverina District.

Unpub. mimeo in three parts: Corowa Sub-District, Griffith Sub-District, Wagga Sub-District. Species arranged alphabetically in genera, with locations, distributions and common names.

94. Fraser, L. and Vickery, J.W. (1937).—Notes on some species occurring in the Upper Williams River and Barrington Tops districts, with descriptions of two new species and two new varieties. Proc. Linn. Soc. N.S.W. 62: 284–293.

Brief notes of phytogeographical interest on endemic species, species with disjunct distributions and species at limits of their distribution.

95. Fraser, L. and Vickery, J.W. (1938).—The ecology of the Upper Williams River and Barrington Tops districts. II. The rain-forest formations. Proc. Linn. Soc. N.S.W. 63: 139–184.

96. Fraser, L. and Vickery, J.W. (1939).—The ecology of the Upper Williams River and Barrington Tops districts. III. The eucalypt forests, and general discussion. Proc. Linn. Soc. N.S.W. 64: 1–33.

Detailed reconnaissance ecological survey. Floristic lists in part II are: species occurring in subtropical rain-forest and rain-forest margins of the Williams River valley (with life form and quantitative frequency classes); quadrat figures for a number of sites in the Williams River; list of rain-forest species observed in the upper Chichester and Manning River valleys; list of species in the sub-antarctic rain-forest (with growth form and quantitative frequency); list of species from other areas (Comboyne, Dorrigo, Port Macquarie, Upper Hastings River and Kramback Mountain) *not* seen in Williams River.

Floristic lists in part III are: plants occurring in eucalypt forest formations grouped under associations (with qualitative frequency); species common to the sub-alpine forest or grassland and the swamps; distribution (Tas., Vic., N.S.W.) of the sub-alpine and montane species; and life form spectra of the vegetation formations.

97. Gandoger, M. (1899).—Note sur la flore du Mont Kosciusko (Australie meridionale). Bull. Soc. Bot. France 46: 391–394.

Short list of species, in French.

98. Gilbert, L. (1947).—Glimpses of a sub-tropic rain-forest. Vict. Nat. 63: 196–198.

No list, names included in text discussion. Located at Mt Talawahl, near Nabiac, south of Taree.

99. Giles, K. (1968).—Orchids of the Tumut Shire. Orchadian 2: 143–144.

100. Giles, W.E. (1961).—A census of the native flora of the south-western corner of the Orange district. Austral. Wild Life 4 (1): 63–71.

Annotated for frequency. Species listed alphabetically in growth forms, with local names and common names.

101. Gordon, E.C. (1965).—The flowering periods of Australian and New Zealand orchids—Section 1, N.S.W. Orchadian 2: 25–30.

Although not intended as a census of N.S.W. orchids, this list, with a few minor exceptions, includes all species.

102. Gray, M. (1961).—A list of vascular plants occurring in the New England tablelands, New South Wales, with notes on distribution. Contrib. N.S.W. Nat. Herb. 3: 1–82.

Species listed under family; notes on many species, some voucher numbers and locations. With map.

103. Gray, M. and McKee, H.S. (1969).—A list of vascular plants occurring on Black Mountain and environs, Canberra, A.C.T. CSIRO Austral. Div. Plant Ind. Tech. Pap. 26.

Annotated for distribution, abundance and voucher specimen number.

104. Green, P.S. (1967).—Spermatophytes recorded for Norfolk and Lord Howe Islands. (Unpub. 24 pp. MS. held in RBG. Lib.).

A compilation from all published sources with notes on the nomenclature and distribution. Copies in RBG. Lib. are annotated for Lord Howe Island endemic species.

105. Hall, C. (1912).—The eucalypts of Parramatta, with description of a new species. Proc. Linn. Soc. N.S.W. 37: 561–571.

List of species and notes on their habitats. Includes a map showing locations of species.

106. Hamilton, A.A. (1915).—Topographical and ecological notes on the flora of the Blue Mountains. Proc. Linn. Soc. N.S.W. 40: 386–413.

Annotated list of species with notes on distribution of the species on the Blue Mountains.

107. Hamilton, A.A. (1919).—An ecological study of the salt-marsh vegetation in the Port Jackson district. Proc. Linn. Soc. N.S.W. 44: 463–513.

No species list included.

108. Hamilton, A.A. (1920).—Excursion to Duck River. Austral. Nat. 4: 140–141.

Short list from a district which is now a suburban/industrial area between Lidcombe and Granville in Sydney.

109. Hamilton, A.G. (1886).—List of the Orchideae of the Mudgee district. Proc. Linn. Soc. N.S.W. (2nd. Ser.) 1: 865–878.

List with notes on locations and habitats.

110. Hamilton, A.G. (1887).—A list of the indigenous plants of the Mudgee district. Proc. Linn. Soc. N.S.W. (2nd. Ser.) 2: 259–306.

List of species, arranged by family, with notes on locations, habitat and distribution.

111. Hamilton, A.G. (1889).—On the flora of Mt. Wilson. Proc. Linn. Soc. N.S.W. 24: 346–380.

Brief notes on vegetation and flora from a basalt capped mountain in the Blue Mountains with floristic list annotated for habitat of the species.

112. Hannon, N.J. (1963).—The regeneration of plant cover on a denuded sandstone area. Proc. Linn. Soc. N.S.W. 88: 47–53.

See Evans (1963).

113. Harris, T.Y. (1938).—The Angophora Reserve. Some notes on the flora. Austral. Wild Life 1 (4): 38–44.

No list. Located at Avalon, near Broken Bay in a coastal sandstone area.

114. Haviland, F.E. (1911).—Notes on the indigenous plants in the Cobar district. Proc. Linn. Soc. N.S.W. 36: 507–540.

Species listed under families with notes on habitats. Area within 80·5 km (50 miles) radius of Cobar; with map showing place names.

115. Haviland, F.E. (1913).—Notes on the indigenous plants in the Cobar district. No. ii. Proc. Linn. Soc. N.S.W. 38: 639–655.

Supplementary list for Haviland (1911) with notes and localities.

116. Helms, R. (1897).—The Australian Alps, or Snowy Mountains. J. Roy. Geog. Soc. Austral. 6: 101–110.

List of the flora with altitudinal ranges.

117. Hemsley, W.B. (1896).—The flora of Lord Howe Island. Ann. Bot. 10: 221–284.

Lists 209 vascular plants; with notes on habitat and distribution.

118. Ingram, C.K. (1963).—Flora of Mt. Horrible. Wild Life Preservation Soc. Austral. Newsletter Sept. 1963.: 6–10.

List with common names. Located north-east of Bathurst.

119. Ingram, C.K. (1964).—Species list, pp. 11–18 in: Anon. (1964). Plants [of the Warrumbungle National Park]. National Parks J., Feb. 1964: 9–18.

List of species from Warrumbungle National Park with very brief text notes on communities, with map and common names. Located west of Coonabarabran.

120. Ingram, C.K. (no date, probably 1960's).—Preliminary list of the flora of the Bathurst/Oberon/Jenolan/Portland area. (27 pp. roneo.)

Listed in families with common names. Some localities.

121. Johnston, F.D. (1968).—Orchid hunting in temperate forests of Mount Warning, New South Wales. Amer. Orchid Soc. Bull. 37: 799–803.

122. Leigh, J.H. and Mulham, W.E. (1965a).—A list of vascular plants occurring in the Riverina Plain, New South Wales, with notes on distribution.

> (37 pp. roneo. Riverina Laboratory CSIRO Deniliquin). Listed under families. No notes in RBG. Lib. copy. Common names.

123. Leigh, J.H. and Mulham, W.E. (1965b).—Pastoral Plants of the Riverine Plain. (Jacaranda Press).

> Many colour and black and white photos of most of the common herbaceous species. Copious notes.

124. von Lendenfeld, R. (1885).—Report on the central part of the Australian Alps. Report by von Lendenfeld to Minister for Mines. (pub. by N.S.W. Dept Mines 21.1.1885, 16 pp.).

> Nineteen species collected, with maps.

125. Le Plaistrier, C.M. (1914).—Plants noticed at Maroubra. Nov. 8th, 1913. Aust. Nat. 3: 11.

> Short list, from coastal area now a suburb of Sydney.

126. Maiden, J.H. (1894).—The Dorrigo Forest Reserve. (Govt. Printer, Sydney, appears to be a Dept of Agriculture Bulletin).

> Annotated list of species arranged in families.

127. Maiden, J.H. (1895).—Notes of a trip to the north central coast forests of New South Wales. Agric. Gaz. N.S.W. 6: 583–612.

> Notes on species seen in various localities.

128. Maiden, J.H. (1898a).—Mount Seaview and the way thither. N.S.W. Dept Agric. Misc. Pub. 230.

> Notes on species seen en route, with map. Located approximately 48·3 km (30 miles) west of Port Macquarie.

129. Maiden, J.H. (1898b).—A contribution towards a flora of Mount Kosciusko. N.S.W. Dept Agric. Misc. Pub. 241.

> Species arranged in families, with some notes.

130. Maiden, J.H. (1898c).—Notes of a trip to Mount Seaview, upper Hastings River. Proc. Linn. Soc. N.S.W. 23: 20–28.

> Brief description of vegetation and flora. No floristic list. Located approximately 48.3 km (30 miles) west of Port Macquarie.

131. Maiden, J.H. (1898d).—Observations on the vegetation of Lord Howe Island. Proc. Linn. Soc. N.S.W. 23: 112–158.

> Does not include a full list, as species noted by Hemsley (1896) are not repeated. With notes on habitat etc., introduced weeds, edible plants, vegetables and economic plants.

132. Maiden, J.H. (1899a).—Some further observations on the vegetation of Lord Howe Island. Proc. Linn. Soc. N.S.W. 24: 381–384.

> Additional notes on the flora.

133. Maiden, J.H. (1899b).—A second contribution towards a flora of Mount Kosciusko. N.S.W. Dept Agric. Misc. Pub. 331.

> Species arranged in families, with notes on habitats.

134. Maiden, J.H. (1901a).—A list of plants collected in the vicinity of the Jenolan Caves, by W.F. Blakely and J.C. Wiburd. N.S.W. Dept Agric. Misc. Pub. 523.

List, with month of collection. Located approximately 32·2 km (20 miles) south-east of Oberon.

135. Maiden, J.H. (1901b).—Presidential address—Botanical survey of New South Wales. Proc. Linn. Soc. N.S.W. 26: 741–805.

Includes a short bibliography of papers containing floristic lists and notes on the flora and vegetation.

136. Maiden, J.H. (1906).—The botany of Howell (Bora Creek): a tin-granite flora. Proc. Linn. Soc. N.S.W. 31: 63–72.

Species arranged in families with a few notes. Located 30·6 km (19 miles) south-east of Inverell.

137. Maiden, J.H. (1906).—The wattles of the County of Cumberland, N.S.W. Austral. Nat. 1: 28–29.

Short list of species, no notes. Located in the Sydney district.

138. Maiden, J.H. (1914).—Further notes on the botany of Lord Howe Island (Fifth Paper). Proc. Linn. Soc. N.S.W. 39: 377–384.

Describes the flora of the summit of Mt Gower and the Admiralty Islets. With miscellaneous notes on the earlier recorded species.

139. Maiden, J.H. (1920).—A few notes on the botany of Lord Howe Island. Proc. Linn. Soc. N.S.W. 45: 564–566.

Adds two further indigenous and 11 naturalized species to the list.

140. Maiden, J.H. and Betche, E. (1916).—A Census of New South Wales Plants. (Govt Printer: Sydney).

The most recent state census. With full author citation, some synonyms cited.

141. Maiden, J.H., Cleland, J.B. and Burrow, G. (1920).—The botany of the Pilliga Scrub, N.S.W. (Bull. 14 of either N.S.W. For. Comm. or N.S.W. Dept Agric.).

List with notes on habitats. Located south-west of Narrabri.

142. Mathias, I. (1961).—Orchids of the Bega district. Vict. Nat. 78: 104–105.

Extracts from a letter to the editor.

143. McBarron, E.J. (1955).—An enumeration of plants in the Albury, Holbrook, Tumbarumba districts of New South Wales. Contrib. N.S.W. Nat. Herb. 2: 89–248.

Listed under families with copious notes on abundance, distribution and habitats. With voucher numbers and map.

144. McKern, J.G. (1958).—Flowering plants of the Uloola Track, Royal National Park, I. Austral. Wild Life 3 (3): 46–52.

Listed inalphabetical order, under locations. Located immediately south of Sydney.

145. McKern, J.G. (1959).—Flowering plants of the Uloola Track, Royal National Park. II. Austral. Wild Life 3 (4): 80–87.

Additions to list in pt I and lists from other localities.

146. McKern, J.G. (1960).—Flowering plants of the Uloola Track, Royal National Park III. Austral. Wild Life 3 (5): 59–63.

Additions to species list from pts I and II.

147. McKern, J.G. (1962).—Deep Creek-Narrabeen proposed parks. List of some plants. Austral. Wild Life 4 (2): 4–7.

Listed in alphabetical order, no ferns. With map and common names. Coastal sandstone creek between Sydney and Broken Bay.

148. McLuckie, J. and Petrie, A.H.K. (1926).—An ecological study of the flora of Mount Wilson. III. The vegetation of the valleys. Proc. Linn. Soc. N.S.W. 51: 94–113.

Species arranged by growth form for six associations: *Ceratopetalum—Doryphora*, *Eucalyptus goniocalyx—E. blaxlandii*, *E. oreades*, *E. piperita* and *E. haemastoma* var. *micrantha*. With qualitative abundance estimates. Located on a basalt-capped mountain in the Blue Mountains.

149. McLuckie, J. and Petrie, A.H.K. (1927).—The vegetation of the Kosciusko plateau. I. The plant communities. Proc. Linn. Soc. N.S.W. 52: 187–221.

Floristic lists arranged ecologically with qualitative estimates of frequency. Includes map. Further parts in this series do not appear to have been published.

150. Melvaine, A.T. (1936).—A check list of New South Wales pteridophytes. Proc. Linn. Soc. N.S.W. 61: 111–121.

With a few taxonomic, but no ecological notes.

151. Messmer, P.R. (1964).—Excursion to Valley of the Waters Reserve and King's Tableland, Wentworth Falls, No. 7. 1964. Wild Life Preservation Soc. Austral. Newsletter No. 12: 3.

List with no notes. Located on the Blue Mountains.

152. Messmer, C.A., Bryce, E.J. and Rupp, H.M.R. (1941).—Flowering plants and ferns of Pulbah Island, Lake Macquarie. (Unpub. MS. in RBG. Lib. with handwritten additions.).

Species arranged by family.

153. Millington, R.J. (1950's).—The ecology of Thomas' Lagoon—a mountain meadow pond. (Unpub. report held in Syd. Univ. Bot. Dept).

154. Millington, R.J. (1950's).—An ecological survey of hygrophilous plant communities of New England. (Unpub. report held in Syd. Univ. Bot. Dept).

Includes floristic lists for sites examined in detail.

155. Millington, R.J. (1954).—*Sphagnum* bogs of the New England plateau, New South Wales. J. Ecol. 42: 328–344.

Table 1 lists species and abundance within the following nine communities recognised in and around the bogs: aquatic, reed swamp, scraw bog, regeneration complex, stillstand complex, laggs and springs, eroded raised bog, wet heath and adjacent swamps. With map.

156. Moore, C. (1884).—A census of the plants of New South Wales. (Govt. Printer: Sydney).

Listed under families.

157. Moore, C.W.E. (1953a).—The vegetation of the south-eastern Riverina, N.S.W. I. The climax communities. Austral. J. Bot. 1: 484–547.

158. Moore, C.W.E. (1953b).—The vegetation of the south-eastern Riverina, N.S.W. II. The disclimax communities. Austral. J. Bot. 1: 548–567.

> Reconnaissance ecological survey. Species grouped under families within the seven alliances recognized. The subformations represented are: dry sclerophyll forest, closed swamp sclerophyll forest and savanna woodland, tall woodland, savanna woodland and shrub woodland, With map.
> Part II has lists for the most common species within the disclimax communities of the various alliances.

159. Moore, C.W.E. (1967).—Flora of northwestern New South Wales. (Unpub. 11 pp. roneo in RBG. Lib.)

> Species collected in 1966–67 listed under families with map. Copy in RBG. Lib. with hand-written annotations.

160. von Mueller, F. (1880).—Notes on plants, collected by Mr Edw. Reader, in the vicinity of Mount Dromedary. Proc. Linn. Soc. N.S.W. 5: 286–288.

> Short list of species. Located 19·3 km (12 miles) south-west of Narooma.

161. Nathan, C.V. (1952).—Fauna and flora of Vaucluse. (Author: Sydney).

> Notes on species, arranged in alphabetical order, in the Vaucluse reserve on the southern side of Port Jackson. Copy in RBG. Lib. has additions and corrections.

162. Oliver, W.R.B. (1917).—The vegetation and flora of Lord Howe Island. Trans. N.Z. Inst. 49: 94–161.

> Species listed under families with notes on habitat and distribution. Vegetation types are described.

163. Osborne, T.G.B. and Robertson, R.N. (1939).—A reconnaissance survey of the vegetation of the Myall Lakes. Proc. Linn. Soc. N.S.W. 64: 279–296.

> Notes on the vegetation. Floristic lists are arranged under ecological groupings (dune scrub, dry and wet heath, rain-forest at two localities); in genera. Located east of Bulahdelah.

164. Parberry, N.M. (no date, probably 1964).—Listing: 900 introduced and native trees, shrubs and climbers at Bowral. (No publishers data—probably author).

> As in title.

165. Parry, O.K. and Parry, P.J. (1960).—Some plants of our ridges and gullies. Cycad 1 (2): 6–7.

> Predominant species listed in text. Gosford district.

166. Petrie, A.H.K. (1925).—An ecological study of the flora of Mount Wilson. II. The *Eucalyptus* forests. Proc. Linn. Soc. N.S.W. 50: 145–166.

> Species listed by growth forms for one association: *Eucalyptus piperita;* and nine societies: *Leptospermum lanigerum*, *Petrophila pulchella*, *E. stricta*, *Casuarina nana*, *Hakea pugioniformis*, *C. distyla*, *Baeckea brevifolia*, *Pteridium aquilinum*, and *Pultenaea flexilis.* Located on a basalt-capped mountain in the Blue Mountains.

167. Pickard, J. (1968).—Aspects of the ecology of the Cronulla sand dunes. (Unpub. B.Sc. Agr. thesis, Univ. of Syd.)

> Species listed under families. Basically an expanded list from Pidgeon (1940). Located immediately south of Sydney.

168. Pidgeon, I.M. (1937).—The ecology of the central coastal area of New South Wales. I. The environment and general features of the vegetation. Proc. Linn. Soc. N.S.W. 62: 315–340.

169. Pidgeon, I.M. (1938).—The ecology of the central coastal area of New South Wales. II. Plant succession on the Hawkesbury Sandstone. Proc. Linn. Soc. N.S.W. 63: 1–26.

170. Pigeon, I.M. (1940).—The ecology of the central coastal area of New South Wales. III. Types of primary succession. Proc. Linn. Soc. N.S.W. 65: 221–249.

171. Pidgeon, I.M. (1941).—The ecology of the central coastal area of New South Wales. IV. Forest types on soils from Hawkesbury Sandstone and Wianamatta Shale. Proc. Linn. Soc. N.S.W. 66: 113–137.

> No locations given for lists, i.e. Nos 168–171 which are probably general lists for the area studied. Pt II: Lists of species occurring in dry scrub, moist scrub, shrub swamp, sedge swamp, plateau forest and gully forest, arranged in families. Pt III: Species of different successions: mangrove swamp, brackish water, fresh water river, and sand dunes. Arranged ecologically. Pt IV. *Eucalyptus* species of different forest types.

172. Pidgeon, I.M. (1942).—Ecological studies in New South Wales. (Unpub. D.Sc. thesis Univ. of Sydney).

> Includes similar species lists as Pidgeon 1937, 1938, 1940, 1941.

173. Pidgeon, I.M. and Ashby, E. (1940).—Studies in applied ecology I. A statistical analysis of regeneration following protection from grazing. Proc. Linn. Soc. N.S.W. 65: 123–143.

> Full floristic list with annotations, density measurements on species in four transects. Located near Broken Hill.

174. Pook, E.W. and Moore, C.W.E. (1966).—The influence of aspect on the composition and structure of dry sclerophyll forest on Black Mountain, Canberra, A.C.T. Austral. J. Bot. 14: 223–242.

> *Eucalyptus macrorhyncha—E. rossii* dry sclerophyll forest. Quantitative data on tree species in table 1, shrubs and herbs in fig. 8.

175. Pryor, L.D. (1939).—Vegetation of the Australian Capital Territory. M.Sc. thesis held in Barr-Smith Library, Univ. of Adelaide.

> List of species are included in an appendix.

176. Rodway, F.A. (1928).—The vegetation of the "Five Islands". Austral. Nat. 7: 73–75.

> Brief list with some notes. Located off Port Kembla.

177. Rose, A.B. (comp.) (1969).—A list of plant species in Kuring-gai Chase National Park based on "A census of trees and plants in Kuring-gai Chase" by O.D. Evans 1959. With additional observations by D.F. Blaxell, W.E. Westman, T.S. Barratt and A.B. Rose. (36 pp. mimeo.)

> Listed under families with common name and annotated for locality, growth form and habitat. Located immediately north of Sydney.

178. Rupp, H.M.R. (1895).—A catalogue of indigenous plants from Hay district, Murrumbidgee River, (Riverina) N.S.W. (Unpub. MS. in RBG. Lib.)

Species listed under families, with habitat notes, and observations notes on some of the species.

179. Rupp, H.M.R. (1904).—Flora of Tamworth. (Unpub. MS. in RBG. Lib.)

Species listed under families with locations, some notes and map.

180. Rupp, H.M.R. (1905).—Native plants found in the Counties of Burnett and Staplyton, and part of Arrawatta, N.S.W. (Unpub. MS. in RBG. Lib.)

Species listed under families, with locations. Located within 80·5 km (50 miles) radius of Warialda.

181. Rupp, H.M.R. (1911).—Native plants collected in the Copmanhurst district, upper Clarence River, N.S.W. (Unpub. MS. in RBG. Lib.)

Species listed under families, no notes.

182. Rupp, H.M.R. (1914a).—Native plants collected at Glen Innes and Bolivia, N.S.W. (Unpub. MS. in RBG. Lib.)

Species listed under families with locations but no notes.

183. Rupp, H.M.R. (1914b).—Native plants collected at Lane Cove River, N.S.W. (Unpub. MS. in RBG. Lib.)

Species listed under families with locations. The Lane Cove River is a tributary of Port Jackson.

184. Rupp, H.M.R. (1924a).—A census of plants collected in the Parish of Bulladelah, N.S.W. (Unpub. MS. in RBG. Lib.)

Species listed under families with locations and map. The use of the word "parish" by Rupp probably means the church parish and not the cadastral parish.

185. Rupp, H.M.R. (1924b).—Flora of the Paterson district, N.S.W. (Unpub. MS. in RBG. Lib.)

Species listed under families, few notes.

186. Rupp, H.M.R. (1925).—On the orchids of the Bulladelah district of New South Wales. Austral. Nat. 5: 217–228.

Notes and list—annotated for flowering period and location.

187. Rupp, H.M.R. (1926a).—Ten days on the upper Allyn River I. Austral. Nat. 6: 4–7.

188. Rupp, H.M.R. (1926b).—Ten days on the upper Allyn River II. Austral. Nat. 6: 17–20.

Includes a list of substrate species for epiphytic orchids. Located on southern watershed of Barrington Tops.

189. Rupp, H.M.R. (1927a).—Greenhood orchids of the Paterson district. Austral. Nat. 6: 57–62.

List of *Pterostylis* species incorporated in text. Located in the Hunter valley.

190. Rupp (1927b).—Orchids of the Paterson district. Austral. Nat. 7: 7–12.

List with localities, in text.

191. Rupp, H.M.R. (1928).—Terrestrial orchids of Barrington Tops, N.S.W. Proc. Linn. Soc. N.S.W. 53: 336–342.

List of species from swamps and sub-alpine woodland.

192. Rupp, H.M.R. (1931a).—Further notes on the orchids of the South Maitland coalfields, with description of a new *Dendrobium* from Bulladelah. Proc. Linn. Soc. N.S.W. 56: 133–138.

68 species listed, with notes on the flowering times.

193. Rupp, H.M.R. (1931b).—Notes on New South Wales Orchids. Proc. Linn. Soc. N.S.W. 56: 458–460.

Adds a further six species to the list in Rupp (1931a).

194. Rupp, H.M.R. (1932a).—Indigenous flora of the Pilliga Scrub etc. (Unpub. MS. in RBG. Lib.)

Species listed under families with a few locations, no notes.

195. Rupp, H.M.R. (1932b).—Plant life in the Pilliga Scrub. Vict. Nat. 49: 187–190.

No list of species but names are included in the text. Located south-west of Narrabri.

196. Rupp, H.M.R. (1933).—The genus *Pterostylis* R.Br. (Orchidaceae). A new scheme of classification, with notes on the distribution of the Australian species. Proc. Linn. Soc. N.S.W. 58: 421–428.

Primarily taxonomic, species listed and state distribution noted.

197. Rupp, H.M.R. (1934).—Orchid-hunting in northern New South Wales. Vic. Nat. 51: 187–188.

No list of species but names are included in the text. Located at Bellingen.

198. Rupp, H.M.R. (1937).—A census of the orchids of New South Wales 1937. Proc. Linn. Soc. N.S.W. 62: 27–31.

List of species with no distribution notes.

199. Rupp, H.M.R. (1940's).—Records of orchids. (Unpub. MS. in RBG. Lib.)

Lists of orchids from the following localities, with date of collection:—
Tamworth 1904,
Warialda 1905,
Copmanhurst 1911,
Barraba 1914,
Lane Cove River 1914–19,
Bulahdelah 1923–24,
Paterson 1924–29,
Eccleston and Barrington Tops 1925, 1928,
South Maitland Coalfields 1930–32,
Bellinger Valley and Dorrigo Highlands 1934,
Brunswick River 1936,
Raymond Terrace 1936–39,
Woy Woy 1933–36,
Middle Harbour-Frenchs Forest 1939–1940's.
This is a compilation by Rupp of all his lists of orchids.

200. Rupp, H.M.R. (1948).—The orchid flora of the central western slopes of N.S.W. Proc. Linn. Soc. N.S.W. 73: 130–136.

With map and list of species. No localities are given for most species.

201. Rupp, H.M.R. (no date, probably 1933–36).—Orchids of Brisbane Water. (Unpub. MS. in RGB. Lib.)

Short list, species arranged in genera, no notes, no locations.

201a. Schunke, J. (1970).—Dingo Flats Wildlife Refuge No. 168. Listing of naturally occurring species. (Unpub. 16 pp. MS. in RBG. Lib.)

List of species found in the Wildlife Refuge and environs. Located 6·4 km (4 miles) north of Mt Coree on the Brindabella Range, 30·6 km (19 miles) west of Canberra.

202. Stewart, D. and Ellis, K.E.E. (1963).—The orchids of the Gloucester district. Orchadian 1: 21.

Listed by habitat type.

203. Story, R. (1963a).—Vegetation of the Hunter Valley. *In* CSIRO Austral. Land Res. Ser. No. 8.

204. Story, R. (1963b).—Supplementary notes on the vegetation of the Hunter Valley land systems. CSIRO Austral. Div. Land Res. Reg. Surv. Tech. Memo. 63/1.

These two papers (i.e. Nos 203 and 204) form a complementary unit. The first contains brief floristic lists and description of vegetation formations. The second supplements these. The vegetation and floristics are described for each land system and a comprehensive floristic list is appended. This list is not complete but covers most species. It is most incomplete in rain forest species, and herbaceous species from other formations.

205. Story, R. (1967).—Pasture patterns and associated soil water in partially cleared woodland. Austral. J. Bot. 15: 175–187.

Herbs occurring on experimental sites at Singleton in the Hunter Valley are listed. Shrubs and trees noted in the text.

206. Story, R. (1969).—Vegetation of the Queanbeyan-Shoalhaven area. *In* CSIRO Austral. Land Res. Ser. No. 24: 113–133.

A reconnaissance survey of the vegetation. No lists of species are included for each vegetation form. However, appendix III is a list of plants mentioned in the text and their common names. This is probably only a list of predominant species.

207. Sulman, F. (1914).—Orchids collected at Lawson and Valley Heights, April 1914. Austral. Nat. 3: 32.

Short list without notes. Located on the Blue Mountains.

208. Sunraysia Field Naturalists Club (1965).—Check list of plants found in North-Western Victoria and South-Western New South Wales. Unpub. (?), 4 pp. MS.

209. Sutton, C.S. (1923).—Report of the ecological committee. Rept. A.A.A.S. 16: 109–118.

No floristic lists but a "Bibliography of the Australian floristic and ecological plant geography".

210. Trebeck, P.N. (1886).—Mount Wilson and its ferns. Proc. Linn. Soc. N.S.W. (2nd Ser.) 1: 491–496.

Annotated list of ferns, notes on frequency and habitat. Basalt cap in the Blue Mountains.

211. Turner, F. (1903a).—The vegetation of New England, New South Wales. Proc. Linn. Soc. N.S.W. 28: 276–311.

Brief notes on vegetation and flora followed by list of species.

212. Turner, F. (1903b).—Botany of the Darling, New South Wales. Proc. Linn. Soc. N.S.W. 28: 406–442.

Brief notes on the vegetation and flora followed by list of species.

213. Turner, F. (1904).—The botany of south-western New South Wales. Proc. Linn. Soc. N.S.W. 29: 132–181.

Notes on the flora, etc., and unannotated floristic list.

214. Turner, F. (1905).—Botany of north-western New South Wales. Proc. Linn. Soc. N.S.W. 30: 32–91.

Notes on the use of the plants by aborigines and floristic list.

215. Turner, F. (1906).—Botany of north-eastern New South Wales. Proc. Linn. Soc. N.S.W. 31: 361–392.

No list of species but notes on most of the taxa mentioned.

216. Uhlherr, P.H.T. (1966).—Some common orchids of the Sydney metropolitan area. Orchadian 2: 62.

List with flowering period.

217. University of New England Exploration Society (no date but possibly 1965).—Expedition to Nandewars February-March 1965. Report No. 3, 21 pp.

Species arranged in families. Copy in RBG. Lib. with handwritten corrections. Located east of Narrabri.

218. University of Sydney, Botany Department (1962).—Provisional floristic list of Myall Lakes area. (Unpub. 4 pp. roneo in RBG. Lib.)

Species listed under families, with annotations about habitat. Located on coast east of Bulahdelah.

219. University of Sydney, Botany Department (1962?).—Check list of vascular plants found on Warrah Sanctuary. (Unpub. 10 pp. roneo in RBG. Lib.).

Species listed under families, with annotations about habitat. Located on northern shore of Broken Bay. Copy in RBG. Lib. with handwritten corrections.

220. Vickery, J.W. (1953).—A census of the native Gramineae of New South Wales. Contrib. N.S.W. Nat. Herb. 2: 67–88.

Taxonomic paper, cites some synonyms.

221. Vickery, J.W. and Thompson, J. (1958).—Species collected at Happy Jacks Plain (Upper Tumut R.). (Unpub. 5 pp. MS. in RBG. Lib.)

List of species with no notes. Located in the Snowy Mountains.

222. Warren Wilson, J. and Leigh, J.H. (1964).—Vegetation patterns on an unusual gilgai soil in New South Wales. J. Ecol. 52: 379–389.

> Study area located 20·9 km (13 miles) north of Deniliquin in the Riverina. Quantitative data given for some herbaceous species, other species are mentioned in text.

223. Williams, O.B. (1955).—Studies in the ecology of the Riverina plain. I. The gilgai microrelief and associated flora. Austral. J. Bot. 3: 99–112.

> Species listed under growth habit.

224. Williams, J.B. (1966a).—Plants of the Iluka rainforest. (Univ. of New Eng. Bot. Dept, unpub. 9 pp. roneo)

> Species listed under families, with common names and qualitative abundance. Located at Yamba on the North Coast.

225. Williams, J.B. (1966b).—Plants of the Iluka rainforest. (Univ. of New Eng. Bot. Dept, unpub. 14 pp. roneo).

> Expanded list of Williams (1966a). Species subdivided according to growth form.

226. Williams, J.B. (1966c).—A preliminary list of the seed plants of the Gibraltar Range National Park. (Univ. New Eng. Bot. Dept, unpub. 12 pp. mimeo).

> Listed under ecological types, then under families with notes about form and habitat. Located approximately 48·3 km (30 miles) north-east of Glen Innes.

227. Williams, J.B. (1967a).—A check-list of the native trees and shrubs occurring in rainforests in New South Wales. (Univ. New Eng. Bot. Dept, unpub. 13 pp. roneo)

> Species listed under families, with common names.

228. Williams, J.B. (1967b).—Plants of the coastal heath, scrub and swamp-heath communities in northern N.S.W. (Univ. New Eng. Bot. Dept, unpub. 11 pp. roneo)

> Species listed under families, with common names. Composite list for the area between Coffs Harbour and Tweed Heads.

229. Williams, J.B. (1967c).—Non-eucalypt medium-sized to large trees of the north coast of N.S.W. found in sclerophyll forest rather than rainforest. (Univ. of New Eng. Bot. Dept, unpub. 1 p. roneo)

> Species listed by family, with common names.

230. Williams, J.B. (1970).—A list of the plants of the Gibraltar Range National Park, N.S.W. Part 2: Plants of the rainforests. (Univ. of New Eng. Bot. Dept, unpub. 12 pp. roneo)

> Species listed under families within subdivisions according to growth form. Includes common names. Located approximately 48·3 km (30 miles) north-east of Glen Innes.

231. Willis, J.H. (1967).—Floras of Hanging Rock, Malebo Hill and Mt. Galore. (Unpub. 4 pp. MS. in RBG. Lib.)

> Species listed under families. Located near Wagga Wagga.

232. Willis, J.H. (No date, probably 1967).—Flora of the Rock Nature Reserve No. 24. (Unpub. 3 pp. roneo in RBG. Lib.)

Species listed under families. Located south-west of Wagga Wagga.

233. Wood, E.J.F. (1959).—Some east Australian sea-grass communities. Proc. Linn. Soc. N.S.W. 84: 218–226.

No list of species but reference is made to the floristics of the communities in the text.

234. Woolls, W. (1880a).—Eucalypts of the County of Cumberland: their classification, habitat and uses. I. Proc. Linn. Soc. N.S.W. 5: 288–294.

235. Woolls, W. (1880b).—Eucalypts of the County of Cumberland: their classification, habitat and uses. II. Proc. Linn. Soc. N.S.W. 5: 448–458.

236. Woolls, W. (1880c).—Eucalypts of the County of Cumberland: their classification, habitat and uses. III. Proc. Linn. Soc. N.S.W. 5: 463–469.

As in title, no list of species. Located around Sydney.

237. Woolls, W. (1880d).—Eucalypts of the County of Cumberland: their classification, habitat and uses. IV. Proc. Linn. Soc. N.S.W. 5: 488–493.

238. Woolls, W. (1880e).—Eucalypts of the County of Cumberland: their classification, habitat and uses. V. Proc. Linn. Soc. N.S.W. 5: 503–510.

239. Woolls, W. (1880f).—Plants indigenous in the neighbourhood of Sydney. (Govt Printer: Sydney).

Species arranged in families.

240. Woolls, W. (1885).—The plants of New South Wales. (Govt. Printer: Sydney).

List with some annotations of ecological value.

241. Woolls, W. (1887).—A glance at the flora of Mount Wilson. Proc. Linn. Soc. N.S.W. (2nd Ser.) 2: 6–12.

Included for historical purposes. Discussion of species observed, no lists. Located in the Blue Mountains.

242. Woolls, W. (1891).—Plants indigenous and naturalized in the neighbourhood of Sydney. (Govt Printer: Sydney).

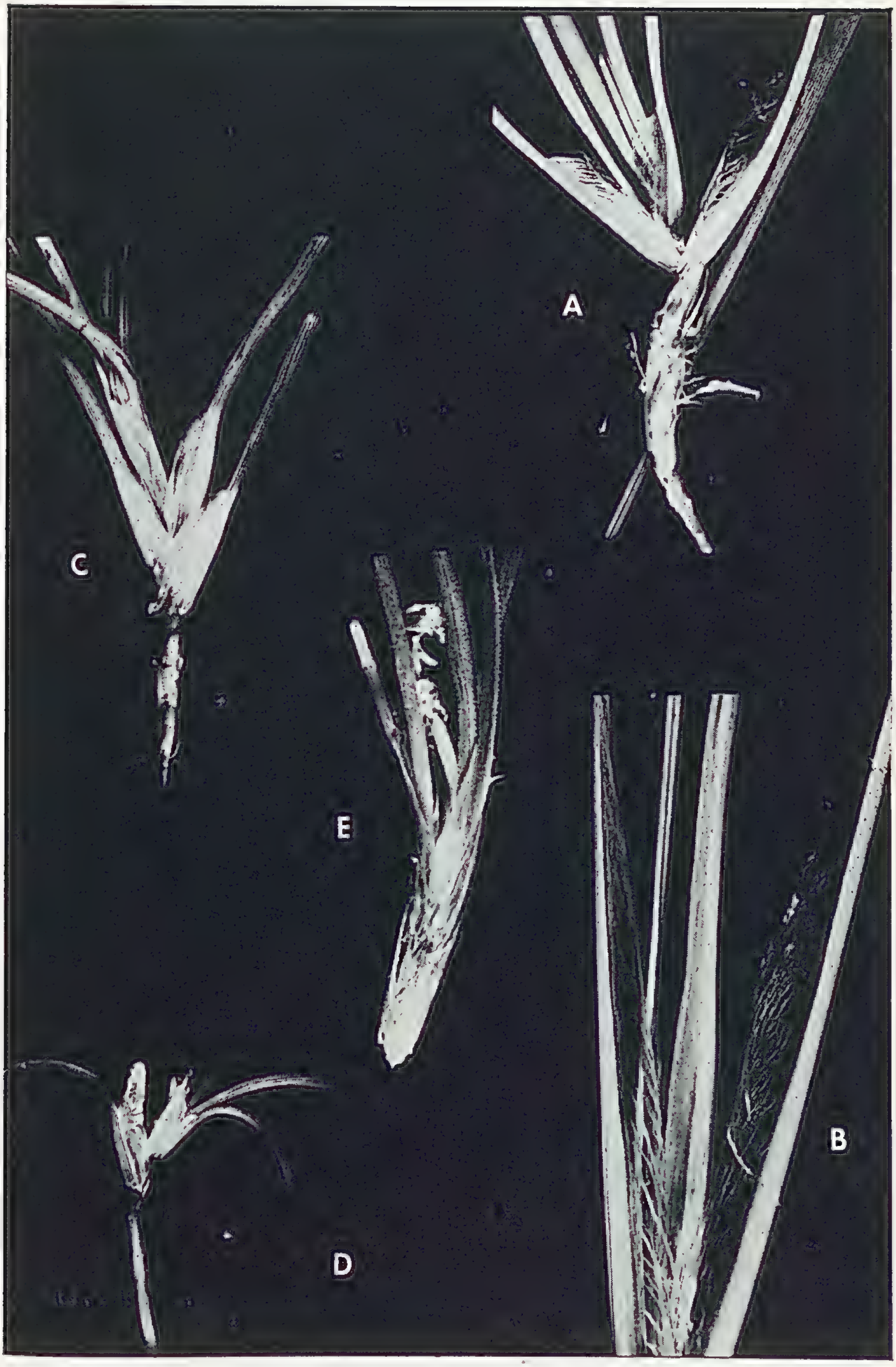
Species listed under families.

243. Workers' Educational Association Plant Ecology Group (1959).—List of native plants (recorded in the Lake Parramatta Reserve). Austral. Wild Life 3 (4): 12–14.

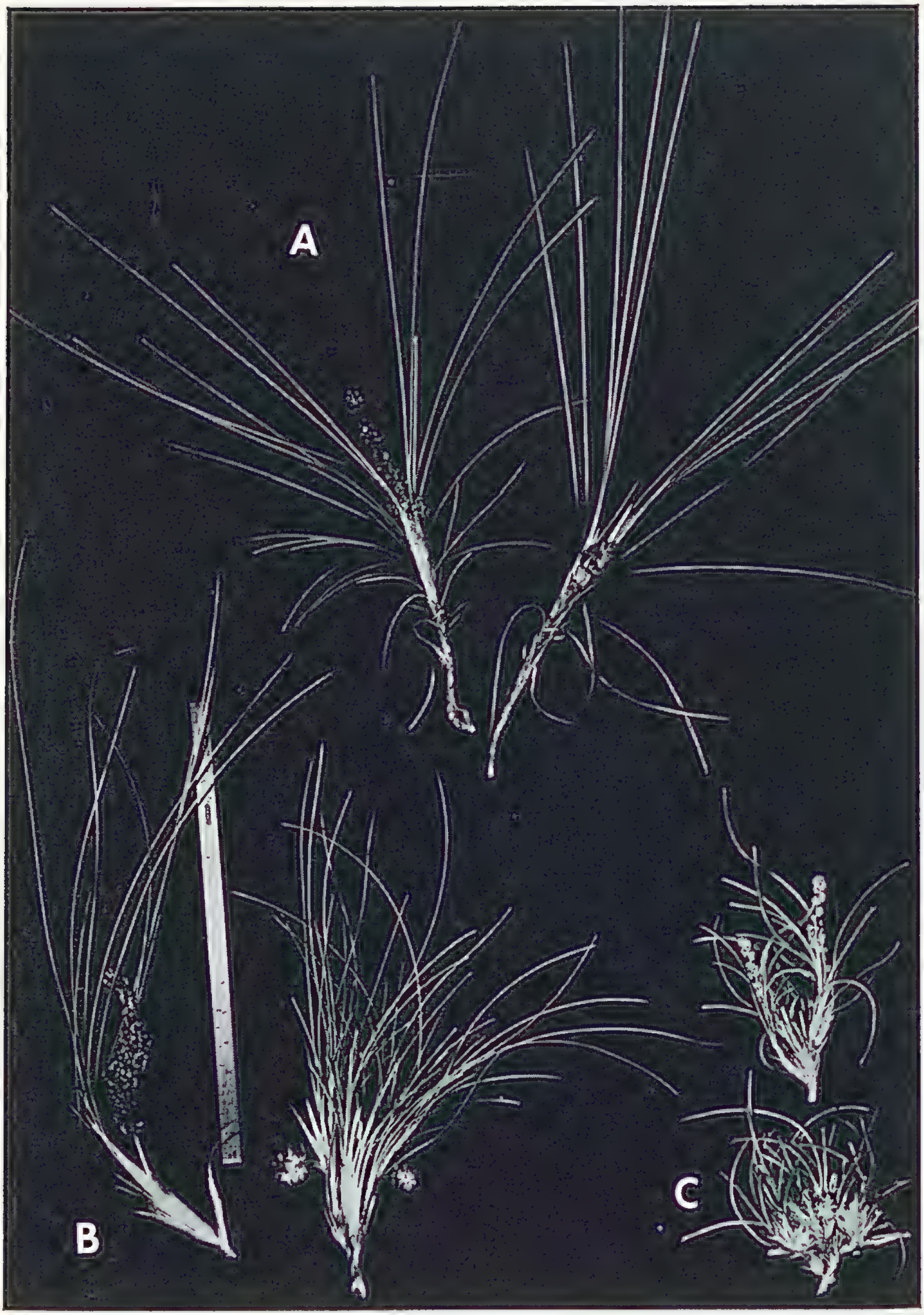
In alphabetical order with common names.

ACKNOWLEDGEMENTS

It is a pleasure to thank the botanists, especially Dr. L.A.S. Johnson, of the National Herbarium of New South Wales for assistance, encouragement and advice. Associate Professor R.C. Carolin, University of Sydney, Professor N.C.W. Beadle, University of New England and Professor L.D. Pryor, Australian National University, checked early drafts as well as permitting access to theses and unpublished reports.

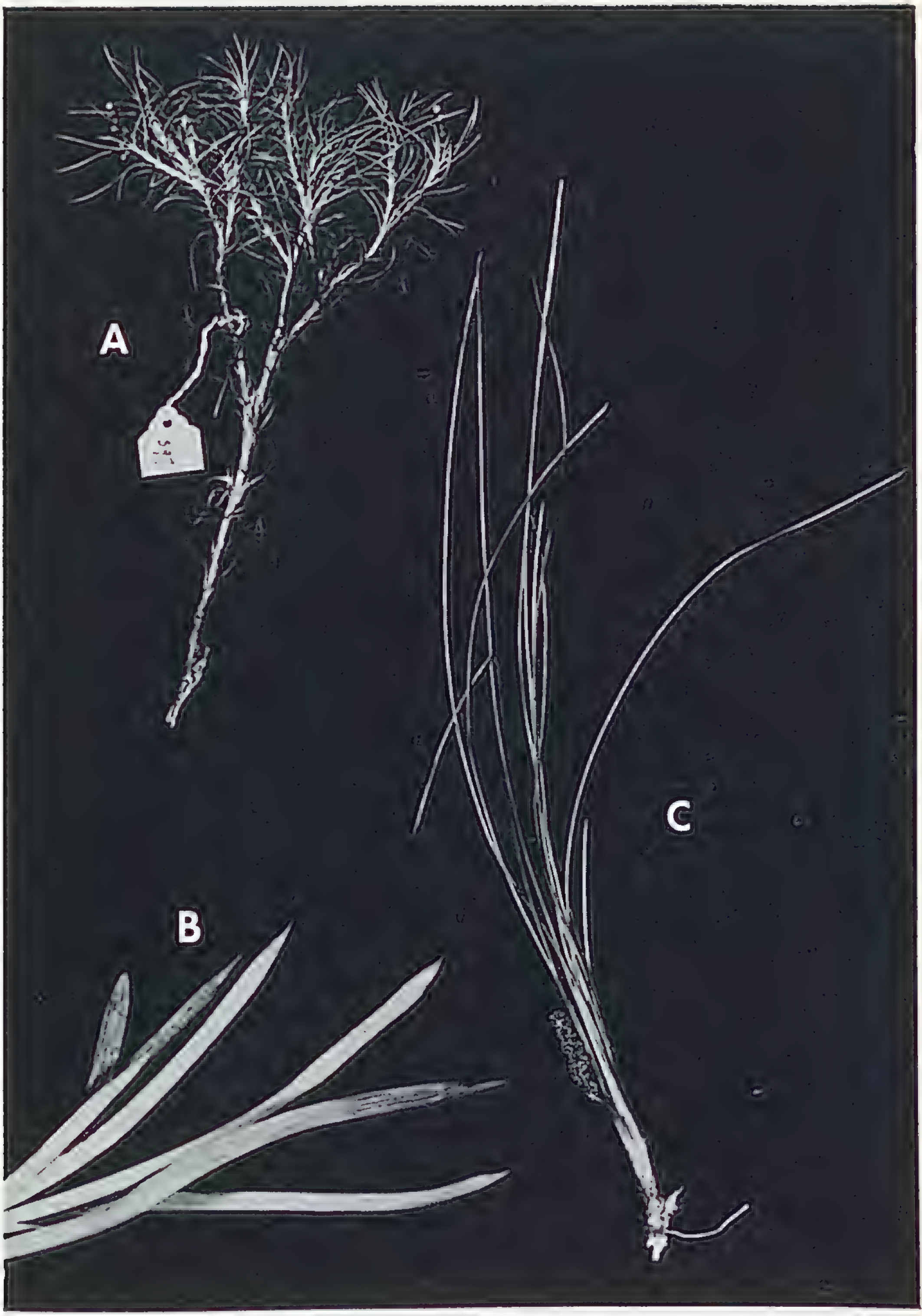


Leaf-base margins: A. *Lomandra glauca* ssp. *glauca*. B. *L. glauca* ssp. *collina*. C. *L. mucronata*. D. *L. obliqua*. E. *L. glauca* ssp. *nana*. A-E, × c. 3.

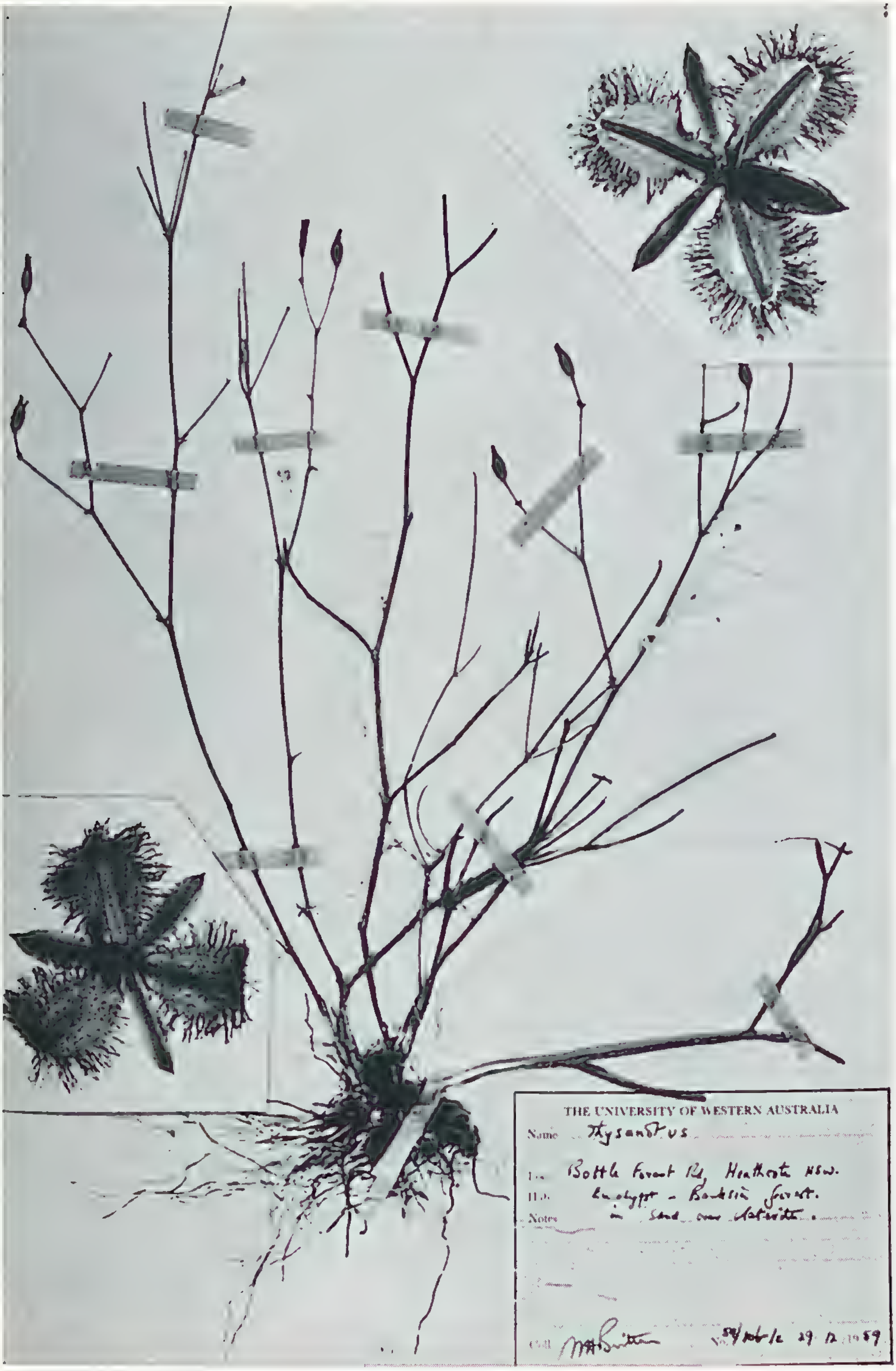


Shoots from male and female plants: A. *Lomandra glauca* ssp. *glauca*. B. *L. glauca* ssp. *collina*. C. *L. glauca* ssp. *nana*. Magnification as scale, × c. 0·4.

Plate XX



Shoot from a male plant: A. *Lomandra mucronata*, × c. 0·4. B. ditto, leaf apices, × 4·0. C. *L. elongata*, × c. 0·4.

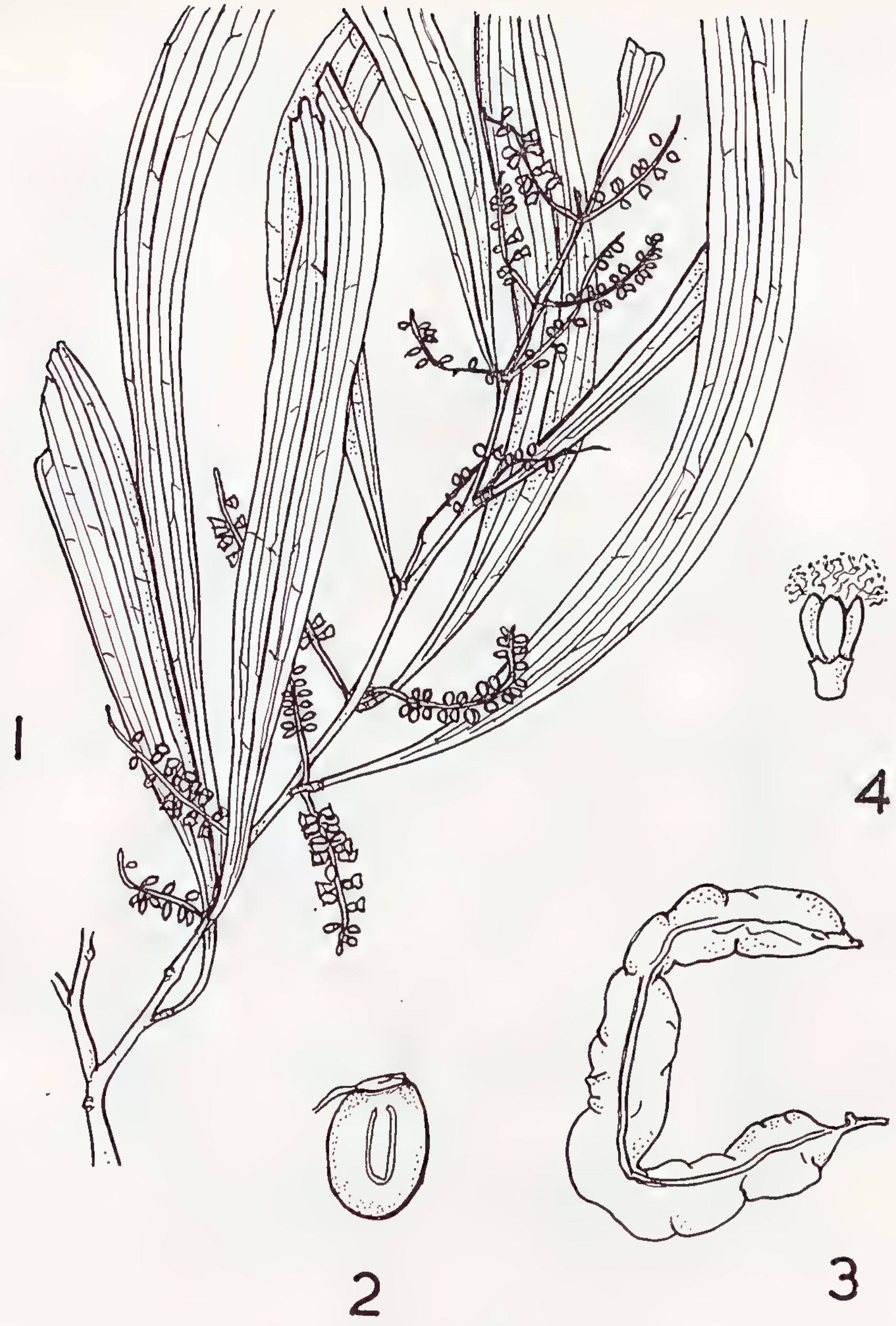


THE UNIVERSITY OF WESTERN AUSTRALIA
Name Thysanotus
Loc. Bottle Forest Rd, Heathcote NSW.
Hab. Eucalypt - Banksia forest.
Notes in sand over laterite.
Coll. M. H. Brittan No. 59/106/1c 29. 12. 1959

Thysanotus virgatus
Isotype, Brittan 59/106–1c (MEL). Centre: vegetative parts, × 0·5. Lower L.H.S. and upper R.H.S.: flowers, × 1·5.

Plate XXII

del. M. D. Tindale

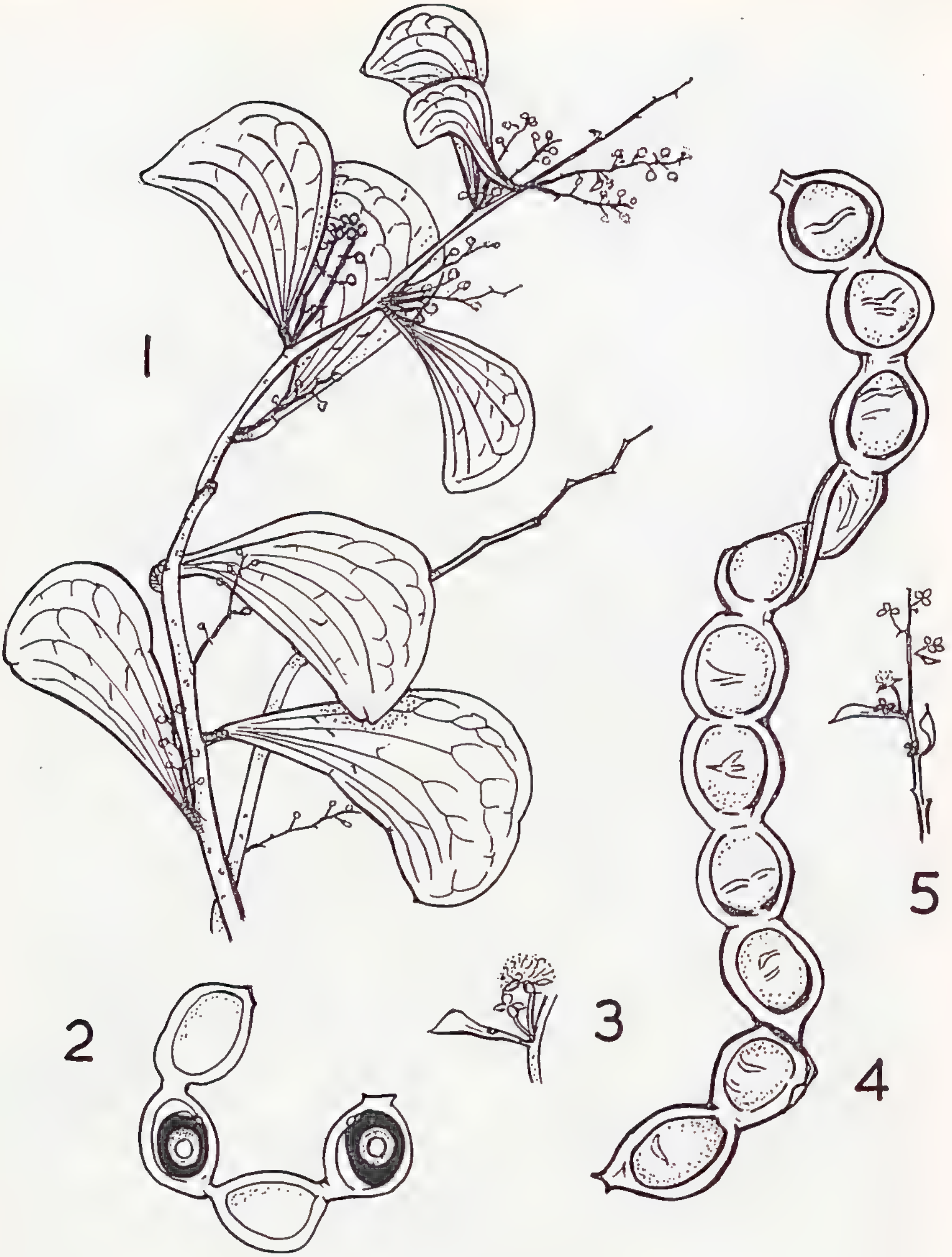


Acacia crassifrugis

1. Foliage and inflorescences, × 2/3. 2. seed, × 2. 3. legume, × 2/3. 4. flower, × 4⅔.

Plate XXIII

del. M. D. Tindale

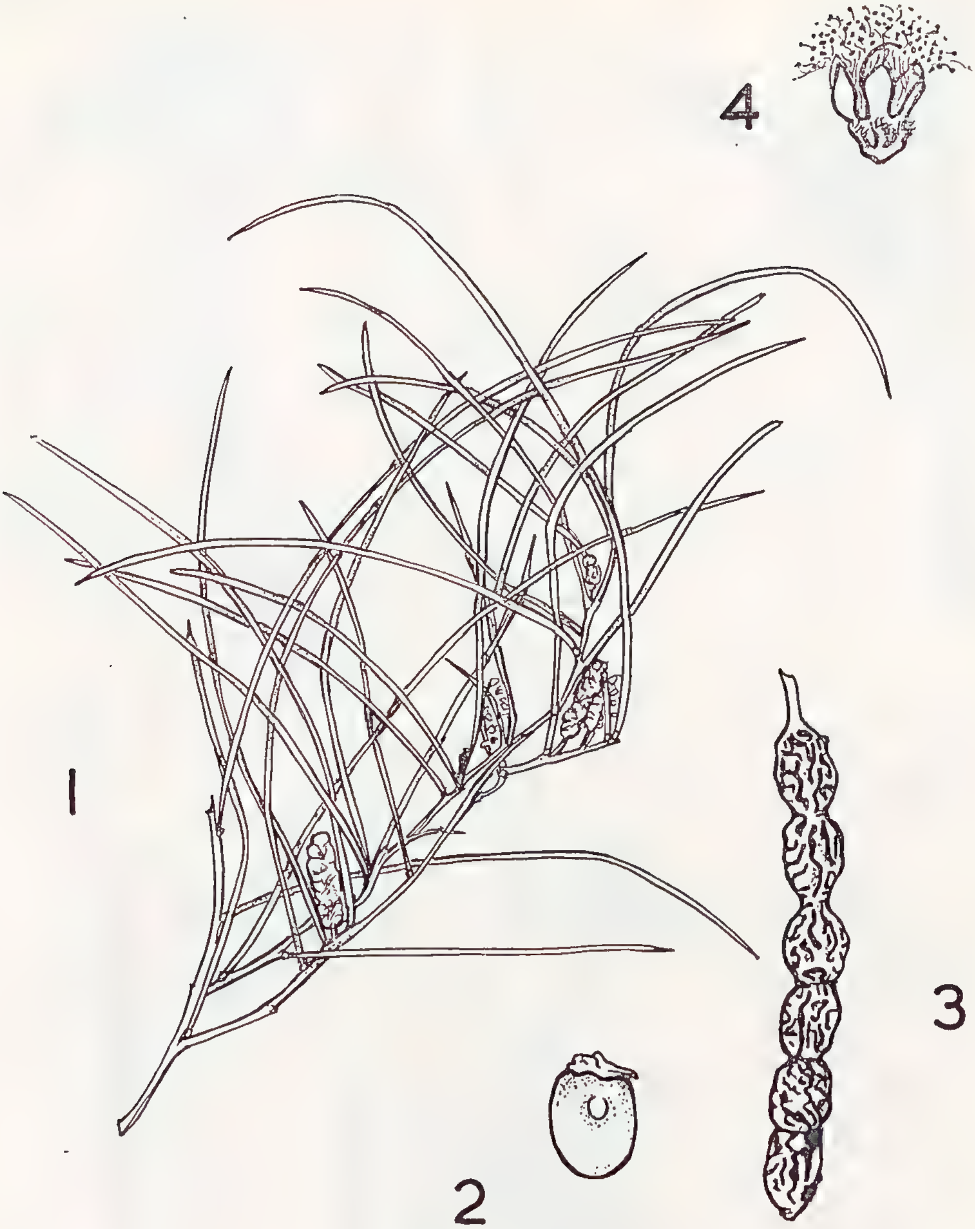


Acacia anaticeps

1. Foliage and inflorescences, × 2/3. 2. seeds in open legume, × 2/3. 3. capitula, × 2. 4. legume, × 2/3. 5. panicle, × 2/3.

Plate XXIV

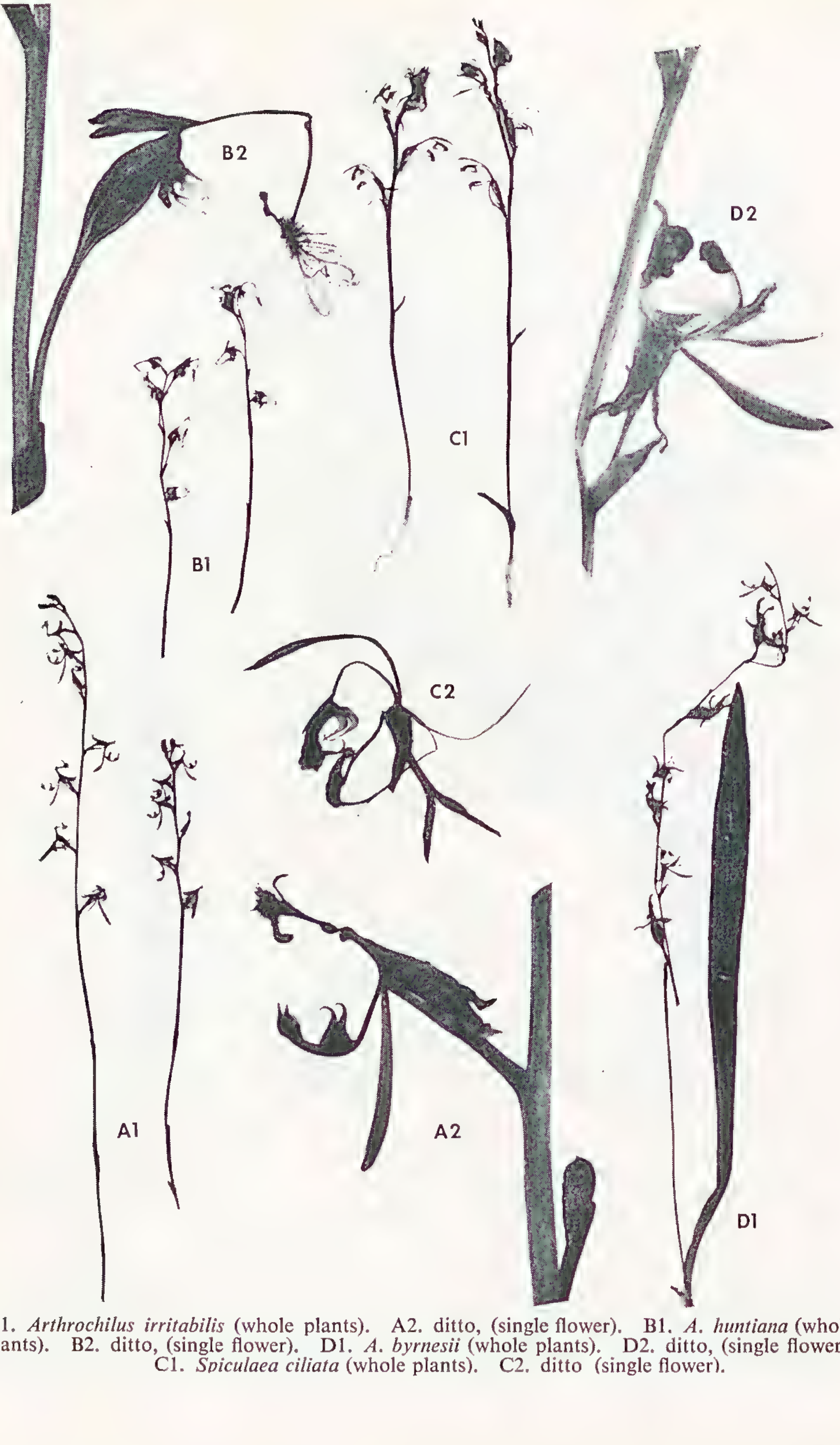
del. M. D. Tindale



Acacia wanyu

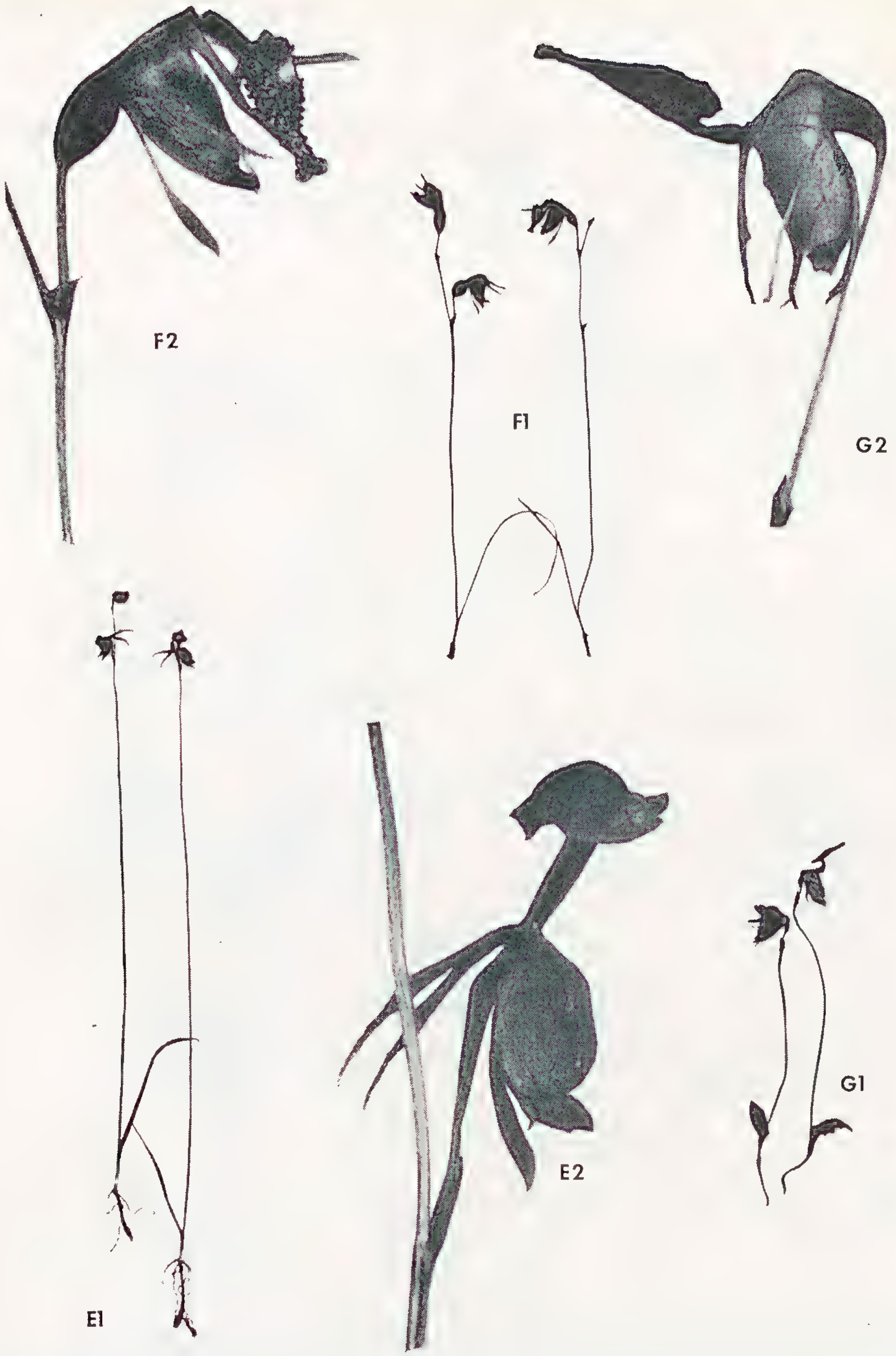
1. Foliage and inflorescences, × 2/3. 2. seed. × 1⅓. 3. legume, × 2/3. 4. flower, × 5.

Plate XXV



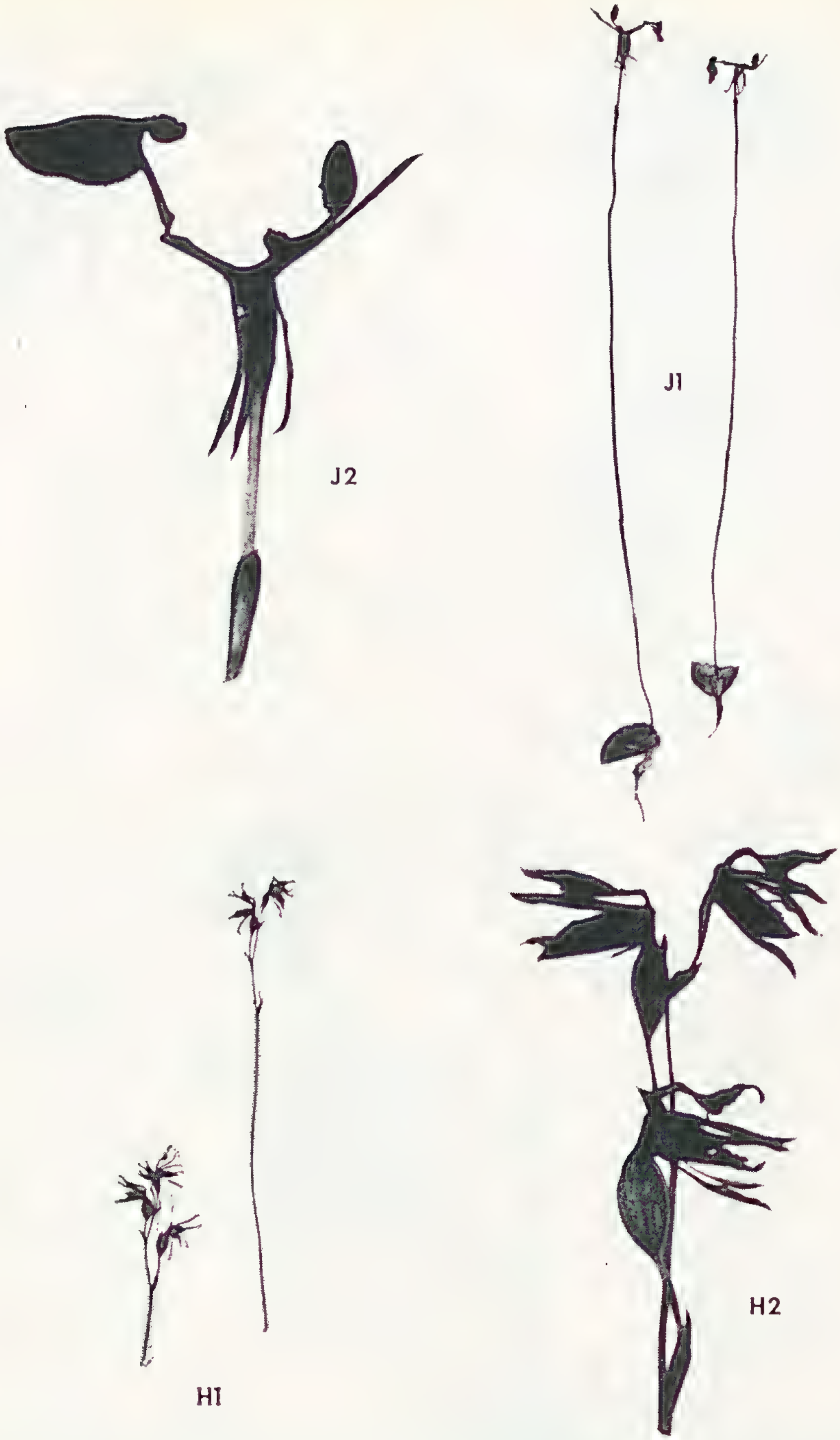
A1. *Arthrochilus irritabilis* (whole plants). A2. ditto, (single flower). B1. *A. huntiana* (whole plants). B2. ditto, (single flower). D1. *A. byrnesii* (whole plants). D2. ditto, (single flower). C1. *Spiculaea ciliata* (whole plants). C2. ditto (single flower).

Plate XXVI



E1. *Caleana major* (whole plants). E2. ditto, (single flower). F1. *Paracaleana minor* (whole plants). F2. ditto, (single flower). G1. *P. nigrita* (whole plants). G2. ditto, (single flower).

Plate XXVII



H1. *Paracaleana sullivanii* (incomplete plants). H2. ditto, flowers. J1. *Drakaea elastica* (whole plants). J2. *D. glyptodon* (single flower).

Michel Gandoger's Names of Australian Plants

D. J. McGillivray

SUMMARY

This paper contains an alphabetical catalogue of Gandoger's names for Australian plants, 212 in all, each with an indication of its present status, a citation of the type(s) together with notes and references when applicable (p. 332). This is preceded by an index to correct or accepted names with the corresponding names used by Gandoger listed as synonyms (p. 326). Lectotypes have been selected for a number of the names. Among 170 binomials there are two which are correct; an additional one may be a correct name for a hybrid and two others may become accepted as a result of current revisionary work. The remaining 165 binomials are placed in synonymy, one of them as the basionym of a correct name. There are also 42 trinomials, all having the rank of *forma.*

Representatives of the following families of Australian plants (including Pteridophyta) have been described by Gandoger:—

> Amaranthaceae, Apiaceae (Umbelliferae), Araliaceae, Aspleniaceae, Asteraceae (Compositae), Baueraceae, Brassicaceae (Cruciferae), Caryophyllaceae, Chenopodiaceae, Compositae, Cruciferae, Cyatheaceae, Cyperaceae, Dilleniaceae, Epacridaceae, Euphorbiaceae, Gentianaceae, Geraniaceae, Gramineae, Juncaceae, Juncaginaceae, Lamiaceae (Labiatae), Liliaceae, Monimiaceae, Myoporaceae, Myrtaceae, Orchidaceae, Papilionaceae, Poaceae (Gramineae), Polygalaceae, Potamogetonaceae, Proteaceae, Psilotaceae, Pteridaceae, Rosaceae, Rutaceae, Santalaceae, Scrophulariaceae, Solanaceae, Thymelaeaceae, Umbelliferae and Xanthorrhoeaceae.

Supplementary information is included in sections dealing with:— Gandoger's taxonomy (p. 319); his publications on Australian plants (p. 321); his nomenclature relating to Australian plants (p. 323); the methods used in this study (p. 324); previous work on Gandoger's types (p. 326), and references (p. 357). There is an Appendix (p. 359) dealing briefly with institutions and individuals which were associated with Gandoger's types. Four examples of the types are shown in plates XXVIII–XXXI. The paper concludes (p. 356) with the suggestion that Gandoger's names for plants from many parts of the world (countries listed alphabetically) provide a useful educational resource for the tiro-taxonomist.

THE PURPOSE OF THIS STUDY

This study was made to eliminate the uncertainty associated with the status and application of Gandoger's names of Australian plants.

GANDOGER'S TAXONOMY

In the Préface to Flora Europae, Gandoger (1883) describes freely the reasons for his taxonomic methods. The following selection of translated passages from the Préface reveals the nature of his approach.

> Like many of my colleagues, I am a convert. On principle, I did not believe in this multitude of related species created by modern science. However, shortly after my beginnings in Botany, I had noticed that each type was manifesting itself in many forms. Inexperienced as I was then, I sided with the opinion of various authors, because I had seen it written and had heard it endlessly repeated, that these forms were only due to the soil, to the climate, to the exposure, etc. But, strangely enough, I noticed that these so-called varieties showed, in their distinctive characteristics, an unequivocal constancy. What could possibly be the cause of this constancy, and why, on the other hand, was it being maintained, that these characteristics were transitory and illusory?

[c.f., Ehrlich and Raven (1969) 1231: "The increasingly refined methods of genetic analysis that are being applied to natural populations are revealing more and more instances of unexpected local differentiation even when the organisms concerned are highly mobile and the populations appear to be continuous".]

> During that time I obtained the writings that were the subject of the memorable controversy between Messrs Jordan and Godron, on the question of the variability of the species. I read both theses, weighed the reasons for and against, and, finally, mainly desirous of being enlightened about the true state of affairs, I decided to resume the experiments carried out by Jordan. This was the infallible means of finding out what to think of this question of species which was so exciting.
>
> I therefore experimented by cultivating a great number of plants, to wit, *Rosa*, *Rubus*, *Centaurea*, *Cirsium*, *Verbascum*, *Mentha*, *Rumex*, *Polygonum*, etc. Naturally, I did not cultivate all the species described hereunder but the results I obtained have been sufficient to strengthen my opinion and for me to consider, without hesitation, these plants as very distinct and highly constant in their characteristics. Moreover, such is the universality of the laws of nature, that it must be necessarily *a priori* admitted, that there is an identical fixity among the species which have not been subjected to experimentation. . .

[Hence Gandoger applied this reasoning to Australian plants, in fact to plants of the world.]

> I thus cultivated certain species for more than fifteen years; each year I compared the crop to that of the previous year, and each time I perceived the same characteristics, the same fixity in the organs; the seeds always supplied me with identical plants. . .
>
> However, if a species has remained invariable in its diagnostic and specific characters for fourteen or fifteen years, it has to be concluded, that it must remain such at least for the next fourteen of fifteen generations, and certainly also for the twenty or thirty to follow. It is of no consequence to know, whether it will have preserved its characteristics in twenty or thirty centuries, as Mr Duval-Jouve demanded. The main thing to establish is that at present, for the duration of our observations, these specific differences have remained stable, in order to proclaim that we are dealing with a legitimate species. We know, that, according to philosophy and natural history, a species is a being invariable in its characteristics preserving indefinitely the same characteristics by descent.
>
> Now, it does not change the question in any way, whether the differences separating two beings are very great or very small.

Here Gandoger's scientific faith is stronger than his reasoning.

It is interesting to consider this approach in relation to Darwinism: the abbé Gandoger had attempted to show that the plant kingdom consists *only* of myriads of distinct and unchanging species, and by reducing the stature of these basic biological units he has seemingly eroded some of the foundations of Darwinism.

The author's experience with Gandoger's work on Australian plants has shown that some of his observations on morphological characters are incorrect and superficial; this same remark may apply to his work on European plants.

By his remarkable, and in some ways, commendable efforts, however ill-directed, Gandoger produced a completed work in accordance with the principles of his scientific beliefs.

Van Steenis (1957) CLXXII makes some practical comment on Gandoger's work:

> If specific delimitation would rest only or predominantly on personal appreciation of characters, the conclusion would be that the number of species would vary freely with each individual taxonomist separately, as artistic creations vary with the artist. The negation of the strongly limited creations of living nature has been employed by a few erratic taxonomists who believed themselves to be free to perpetrate plant taxonomy as if living in clover. Gandoger has enriched botany with such a work on the flora of Europe which has rightly been neglected by taxonomists of common sense.

> . . . it is not a question of knowing whether there are few or many species, nor whether by "cluttering up" the science, they make it easier or more difficult: it is not a question of following an easy science but a true one. (Gandoger, Préface 1883).

GANDOGER'S PUBLICATIONS ABOUT AUSTRALIAN PLANTS

The results of Gandoger's work on Australian plants appear in the following publications:—

1. Note sur la flore du Mont Kosciusko (Australie meridionale). Bull. Soc. Bot. France XLVI (1899) 391–394.
2. La flore de la Tasmanie (Océanie). Ibid. XLVII (1900) 304–308.
3. Lettre de M. Michel Gandoger à M. le Président. Ibid. XLIX (1902) 182–183.
4. Le *Luzula novae-cambriae*. Ibid. LIII (1906) 532–534.
5. Manipulus plantarum novarum praecipue Americae australiorus. Ibid. LIX (1912) 704–710.
6. L'herbier africain de Sonder. Ibid. LX (1913) 414–422, 454–462.
7. Sertum plantarum novarum. Pars prima. Ibid. LXV (1918) 24–69.
8. Sertum plantarum novarum. Pars secunda. Ibid. LXVI (1919) 216–233, 286–307.

In December 1898 the first century of specimens from the Botanic Gardens, Sydney, was sent to Gandoger and during the following year a further 600 specimens were despatched, among them the plants from Mount Kosciusko, collected by Maiden and Forsyth, on which Gandoger based the first of these papers. The letter register of the Botanic Gardens, Sydney, for the years 1899–1902 reveals that, following the receipt of Gandoger's paper on the flora of Mount Kosciusko, the exchange from Sydney was discontinued.

"6.3.00 Forwarding the 10th and last Century of herbarium specimens to M. Gandoger, Arnas France".

This parcel was despatched on 7th March, 1900.

Three weeks later a letter dated 20th February arrived from Gandoger advising that he was "sending botanical works and asking for a return of herbarium specimens" (Letter-register 1899–1902). About this time a set of his monumental holographic Flora Europae (27 vols) arrived. As a result the exchange continued. In May 1902 the Botanic Gardens received 2293 specimens, including 433 cryptogams. By March 1903 a total of 1600 duplicates had been sent from Sydney. The letter register shows that exchange was continued after this date but records of the number of sheets were not added to the register of specimens. From the dates of collection of the types it seems unlikely that exchange continued beyond 1904.

The second paper resulted from work on W.W. Spicer's herbarium which Gandoger had purchased. Apart from Spicer's own collections the herbarium contained material from R.C. Gunn, J. Milligan, A. Simson, J.E. Tenison Woods and several others. Four specimens from other sources were also cited in this paper, their collectors being Burrons (? Burrows), Koch, Menzel and Wilson.

Names with the rank of *forma* were published here. In the introduction to the paper Gandoger remarks:—

> Il faut avoir beaucoup de courage pour renoncer à la tentation de créer de nouvelles espèces, lorsqu'on examine les plantes de ces contrées lointaines pour les comparer avec

> celles d'autres pays. Nous nous étonnons, à juste titre, dans notre pauvre et modeste Europe, du polymorphisme de certains genres; on le serait bien davantage si l'on étudiait les Mimosées, les Myrtacées, les Epacridées, les Proteacées, les Restiacées, etc., de l'hémisphère austral. C'est par douzaines que nos phytographes décriraient des formes, des races, des sous-espèces nouvelles tout autant distinctes — sinon plus — que celles que nous voyons paraître presque journellement.

Maiden (1901), in commenting on Gandoger's first Australian paper dealt very cursorily with the new names:–"Following are some supposed new forms described by M. Gandoger (I think on imperfect evidence) . . ." This provoked Gandoger to produce the third paper, in the form of a letter to the Président de la Société Botanique de France in which he defended his taxonomy, though agreeing in one instance that he was mistaken "parce que les échantillons australiens envoyés sous le nom erroné de *C. caespitosa* ne concordaient pas avec les nôtres". Gandoger concluded the letter by suggesting that his observations should be "dans l'intérêt de la science, traduites en anglais et envoyées à l'administration du Jardin botanique de Sydney". Maiden (1903) replied, in French, no doubt expecting to finalize the correspondence on the subject of *la flore du mont Kosciusko*. After a break of three years Gandoger published the last words in the controversy, reiterating most of his views, including the following:–"Que *Carex Maidenii* Gandoger était *C. Gaudichaudiana* Kunth, erreur causée par une fausse détermination faite au jardin de Sydney". However, he concluded in a more scientific manner with a discussion of the characteristics of *Luzula novae-cambriae* Gandoger and maintained that this species was distinct. Gandoger's views are to some extent upheld by Nordenskiöld (1969) who placed the type of Gandoger's name as an intermediate between two varieties of different species.

In the later papers there is little evidence of such careful attention to the material studied. It should be remembered that Gandoger had a large herbarium [see Charbonnel (1927) 6–7 and Lanjouw and Stafleu (1957) 216] which provided him with opportunities to make valid comparative judgements in a number of instances.

Although the exchange from Sydney had ceased, Gandoger obtained Australian material from other sources. J.H. Willis (1960) states:—

> We [the National Herbarium of Victoria] have records here to show that at least 100 collections were sent to Gandoger, in response to his card of advertisement — 50 on 3/5/1909 and fifty more in 7/1911 . . . that no duplicates of C. Walter collections donated to Gandoger were retained here.

Gandoger may have also received specimens directly from Walter (q.v. Appendix) who was a plant and seed collector.

Max Koch (q.v. Appendix) comments as follows on his association with Gandoger:—

> Monsieur Gandoger Arnas France obtained some 400 sheets of S/A [South Australian] plants from me in exchange for m's Flora of Europe, the most marvellous and unique example of hairsplitting in Botany in existence! He was intending to do a little in the same line with my material when I stopped further supplies and correspondence. Koch (1925).

With this additional material and the 1600 specimens from Sydney, Gandoger continued with descriptions of Australian plants. (For information on institutions and individuals associated with Gandoger's work see the Appendix, page 359).

His first correct name for an Australian plant appeared in the year 1912, in *Manipulus plantarum novarum praecipue Americae australiorus*, viz. *Acaena agnipila* Gandoger; see Orchard (1969). Its alphabetical position gives a false impression of the correctness of the names which follow in the main part of this paper.

The next paper, entitled *L'herbier africain de Sonder* not only contained names for plants from Africa, but also from Australia, India, Timor, New Caledonia, Kamchatka, Turkestan, Spain, Siberia, China, Persia, Guatemala, Mexico, Japan, Cuba, Chile, Argentina, Brazil, Bolivia, United States of America and Arabia. It has been reported by Stearn (1939) that Gandoger's types from Sonder's herbarium were missing. Levyns (1970) has published a new combination *Paranomus bolusii* based on *Nivenia bolusii* Gandoger, for which the type had been recently examined. It is possible that Gandoger's types from Sonder's herbarium also are now available, since the names based on them were published in the same paper with *Nivenia bolusii.*

Gandoger's major contribution to Australian botanical nomenclature is his *Sertum plantarum novarum* (1918, 1919) in which he added 159 new names to the literature (as well as 530 more for about 50 other countries, see page 356). One of these names is a later homonym applied to a taxon then undescribed and now known as *Grevillea steiglitziana* N.A. Wakefield (see plate XXIX). The largest number of names synonymized under one correct name is five, i.e. *Hakea eriantha* R. Br. and *Microseris scapigera* (Soland. ex A. Cunn.) Schultz-Bip. Gandoger's examination of material was at times, and probably frequently, very superficial, e.g. in *Petrophile stylaris* Gandoger the points of the tepals have been mistaken for styles. Descriptions of indumentum are sometimes wrong, e.g. in *Persoonia tasmanica* the pedicels, which have a conspicuous though sparse indumentum are described as ". . . . pedunculi glabri . . . .". Gandoger was several times deceived by misdeterminations, e.g. *Carex maidenii* Gandoger (mentioned earlier) and *Monotoca concolor* Gandoger arose from such mistakes.

GANDOGER'S NOMENCLATURE RELATING TO AUSTRALIAN PLANTS

The nomenclature presented by Gandoger in his papers on Australian plants is not controversial. All the names were effectively published in the Bulletin de la Société Botanique de France. [The nomenclature of his *Flora Europae* 1883–1891 which has caused much discussion, both published and procellar, is dealt with in the following references:—

Gandoger (1883–1891), (1900) 304; Maiden (1901), (1903); Charbonnel (1927); Willmott (1935); Fuchs (1960); Rothmaler (1962); Stafleu (1967); Greuter (1968a) 87–96, (1968b), and McGillivray (1972).]

The author's approach to Gandoger's nomenclature has been:—

1. When a binomial has been published, and there is no direct indication by Gandoger that the taxon is of subspecific rank, it is accepted as a validly published name for a taxon of specific rank.

2. When Gandoger's names are combined with a previously validly published name by the use of the phrase *forma vel species secundi ordinis*, the name is regarded as a validly published trinomial for a taxon with the rank of *forma. Forma* and *species secundi ordinis* are here being treated as synonyms, e.g. the forms of *Helichrysum semipapposum* DC.

There is a special problem with those names in the genus *Rubus* [Gandoger (1918) 25] which have been assigned to the rank of *species secundi ordinis.* In this paper they have been treated as binomials.

METHODS USED IN THIS STUDY

a. General

The types of Gandoger's names were borrowed from Lyon in 1965, and on arrival at the National Herbarium of New South Wales, were distributed to botanists according to their interests and responsibilities. Types of 50 names, 31 of them trinomials, published in the years 1900, 1912 and 1913 were not borrowed, but the names have been included in this study (sometimes including citation of isotypes in the National Herbarium of New South Wales) with the words "Not seen" appended to the descriptions of the types.

Much of the taxonomic work associated with this paper has been done by my colleagues; their names appear below the paragraphs for which they provided the data. Paragraphs without a person's name are the work of the author.

Each of Gandoger's names was studied in the following way. With the original description at hand the type was examined and determined. The status of the specimen(s) on each sheet was also noted on the determinavit label. Collections at the National Herbarium of New South Wales were checked for the presence of duplicates (isotypes or isosyntypes). If duplicates were not present, a specimen which was "a good match" for the type was selected. References to isotypes and to specimens matching the types are given in the catalogue of names, although this data was rarely included on the determinavit slips. Lectotypes were selected for a number of these names, and sheets have been annotated accordingly. After completion of the determinations the sheets were returned to the author for compilation of the catalogue of names (see below for *Method of Compilation*). When the compilation was completed, the sheets were photographed. Two sets of prints have been obtained; one set has been put away in the herbarium (NSW) in the appropriate systematic positions, the other set is available to institutions which may wish to borrow photographs. The types have been returned to LYON, with the exception of seven sheets of *Euphrasia* and two sheets of *Prostanthera* which were lent, with the kind permission of the curator of the LYON herbarium, to the State Herbarium of South Australia, Adelaide.

b. Method of Compilation

The catalogue of names with the information about them is based on the following format:—

Gandoger's name, place of publication, original spelling if orthographically incorrect.
Correct name, name according to original determination when this is different from the correct name.
Citation of types. Notes and references when applicable.

The name Gandoger is not abbreviated although he used both *Gdgr.* and *Gand.* The former is of unacceptable construction, giving little indication of the author's name; the latter may be confused with the abbreviations for the names of J.F.A.P. Gaudin and C. Gaudichaud-Beaupré.

When the orthography of a name is incorrect the original spelling is given after the place of publication. The change from capital initial letters for specific epithets to small initial letters has not been indicated unless a further correction was needed, e.g. . . . *milliganii* Gandoger, ibid. 307, '*Milligani*'.

The term *correct name* is used in the generally accepted sense, i.e. the name which is believed to be correct. For most types the original determination is the correct name, or a synonym of it. When the type has been misdetermined initially the entry reads:— "originally misdetermined as . . .", e.g.

" — *Leucopogon gelidus* (Benth.) N.A. Wakefield, originally misdetermined as *Monotoca elliptica* R. Br.

Citation of types follows the form:—

> State of Australia, place name or locality, collector's(s') name(s) collector's number, month of collection-year (source of material as indicated by the label).

The term *Type* has been used in preference to that of *Holotype* for names whose types have not been examined. When a collector's name could possibly be mistaken for a locality, or when the year of collection could be confused with a collection number the affix *s.n.* is used. When Gandoger has cited localities or collectors' names incorrectly, the original citation is given in parenthesis beside the correct version of the names, e.g. Oyster Cove ('Gyster Oove'), Launching Place ('Lunching Place') Gregson ('Greysow'), Bäuerlen ('Baker'). Errors in Gandoger's citation of places and names may be due to printer's errors but a number of them could reasonably be the result of transcriptions from illegible or inadequate information on labels.

Sometimes Gandoger has cited collectors in a way which suggests that there are syntypes, when there is only a holotype, e.g. the holotype of *Lomatia arguta* Gandoger is cited as "in m. Wilson (Gregson! Maiden!)," but the specimen was collected by Gregson and sent to Gandoger from the Botanic Gardens, Sydney by J.H. Maiden. There are several examples of differences between the collector's name on the type and that shown on the isotype, e.g. the type of *Grevillea patulifolia* Gandoger was collected by J.H. Rumsey, as the isotype at the National Herbarium of New South Wales shows, but on the holotype the collector's name is given as "J.H. Maiden". In examples like this the actual collector's name is given in parenthesis with the citation of the isotype. Notes following the citation of types include references to publications in which Gandoger's names are cited, information about transfer of specimens prior to their despatch to Gandoger and any other noteworthy points.

During this study there has rarely been any difficulty in typifying the names published by Gandoger; almost all of the holotypes have labels on which Gandoger has written the name. When there are syntypes the sheet bearing the name in Gandoger's script was usually the one which most definitely satisfied the published description. In only two instances were there problems arising from the misplacement of labels, these were with the types of *Dryandra quinquedentata* Gandoger and *D. cygnorum* Gandoger, as well as the types of *Xerotes apiculata* Gandoger and *X. fibrillosa* Gandoger.

A number of type sheets bear more than one specimen of the same taxon. When this material is of a mixed gathering and it was clear that a particular element was used in establishing the diagnosis (i.e. other elements are discordant) then this element is here regarded as the Holotype. To some this may appear to be equivalent to lectotypification. However lectotypes were selected only when there were syntypes or when such selection otherwise increased the clarity of the typification. The names whose type sheets consisted of discordant elements from which holotypes were isolated are:—

Grevillea neurophylla, *Hakea laevipes*, *Hakea recondita*, *Persoonia breviuscula*, *Persoonia latiuscula*, *Persoonia porrigens* and *Ricinocarpos proximus*.

There are also some sheets bearing more than one taxon; these are:— *Enchylaena falcatula*, *Euphrasia crassiuscula*, *Grevillea alpivaga*, *Grevillea approximata*, *Hakea glabriflora* (see plate XXXI) and *Millotia hispidula*.

PREVIOUS WORK ON GANDOGER'S TYPES OF AUSTRALIAN PLANTS

Several botanists have examined some of these types and/or published data about them:—

> Maiden (1901), (1903) — *Carex*, *Luzula*, *Potamogeton* and *Trisetum*; Hill 1927 — *Crantzia*; Hubbard (1935a), (1935b) — *Echinopogon* and *Zoysia*; Du Rietz (1948) — *Euphrasia*; Eichler (1963) — *Crantzia*; Schodde (1963) — *Millotia*; Willis (1967) — *Euphrasia*; Blake (1968) — *Melaleuca*; Nordenskiöld (1969) — *Luzula*; Orchard (1969) — *Acaena*; Wilson (1970) — *Eriostemon*; Schodde (pers. comm. 1971) — *Atherosperma*.

Blake (1968) 17, 23, also deals with names having types of non-Australian origin, viz. *Melaleuca eriorachis* and *M. abominensis*. The orthography of the name with the type from Amboina is probably not as Gandoger intended, and the misspelling of *Melaleuca* ('*Malaleuca*') suggests that it is another printer's error. However, Gandoger's experience with the formation and publication of "specific" epithets is unsurpassed.

INDEX TO CORRECT NAMES

This index provides cross-references from correct names and formerly accepted names, to names published by Gandoger which are listed in the following section of this paper. The relevant genera of each family are also listed.

Binomials without author citations are names published by Gandoger. Trinomials published by Gandoger are also listed.

Acaena agnipila Gandoger, a correct name.

A. anserinifolia (Forst. et Forst. f.) Druce sens. lat., see *A. dumulosa*.

A. echinata var. *subglabricalyx* (Bitter) Orchard, see *A. pennatula*.

A. montana Hook. f., see *A. tasmanica*.

AMARANTHACEAE — see *Ptilotus*.

Amphipogon strictus R. Br. var. *strictus*, see *A. elatior*, *A. imbricatus*.

Anthocercis eadesii F. Muell. is a synonym of *A. frondosa* (Miers) J.M. Black.

A. frondosa (Miers) J.M. Black, see *A. genistifolia*, *A. tenuipes*.

APIACEAE — see *UMBELLIFERAE*.

ARALIACEAE — see *Astrotricha*.

ASPLENIACEAE — see *Asplenium*.

Asplenium flabellifolium forma *tasmanicum* Gandoger.

ASTERACEAE — see *COMPOSITAE*.

Asterolasia asteriscophora (F. Muell.) Druce, see *Eriostemon spathulifolius*.

A. muelleri Benth., see note under *Eriostemon spathulifolius*.

Astrotricha ledifolia DC., see *A. obtusifolia.*

(*ATHEROSPERMATACEAE* — see *Atherosperma*).

Atherosperma moschatum Labill., see *A. dilatatum, A. elongatum, A. muticum, A. tasmanicum.*

Bassia diacantha (Nees) F. Muell., see *Enchylaena falcatula.*

BAUERACEAE — see *Bauera.*

Bauera rubioides Andr., see *B. glabriflora.*

BRASSICACEAE — see *CRUCIFERAE.*

Burchardia umbellata R. Br., see *B. rigida.*

Caesia parviflora R. Br., see *C. cygnorum, C. dichotomizans.*

Cardamine tasmanica Gandoger — group under revision.

Carex caespitosa L., see note under *C. maidenii.*

C. canescens L., see note under *C. maidenii.*

C. gaudichaudiana Kunth, see *C. maidenii.*

C. hebes Nelmes, see note under *C. maidenii.*

Carpha alpina R. Br., see *C. tasmanica.*

CARYOPHYLLACEAE — see *Spergularia.*

Caustis flexuosa R. Br., see *C. tenuirama.*

Centaurium tenuiflorum (Hoffmannsegg et Link) Fritsch, see *Erythraea cymuligera.*

Chamaescilla corymbosa F. Muell. ex Benth., see *C. tasmanica.*

CHENOPODIACEAE — see *Chenopodium, Enchylaena, Rhagodia.*

Chenopodium nitrariaceum F. Muell., see *C. lycioides* and note under *C. ulicinum* Gandoger.

C. ulicinum Gandoger, a correct name.

Comesperma ericinum DC. forma *aristulosum* Gandoger, forma *esulifolium* Gandoger, forma *tasmanicum* Gandoger, forma *uncinatum* Gandoger.

COMPOSITAE — see *Helichrysum, Microseris, Millotia, Olearia, Podolepis.*

Conospermum longifolium Sm., see *C. scolopendrinum, C. scorzonerifolium.*

Conospermum patens Schlechtd., see *C. cucullatum, C. helichrysoides.*

C. stoechadis Endl., see *C. elegantulum, C. proximum.*

CRUCIFERAE — see *Cardamine.*

Culcita dubia (R. Br.) Maxon, see *Davallia cristatella, D. muelleri, D. tasmanica.*

CYATHEACEAE — see *Culcita.*

CYPERACEAE — see *Carex, Carpha, Caustis.*

Davallia dubia R. Br. is a synonym of *Culcita dubia* (R. Br.) Maxon.

Dianella revoluta R. Br., see *D. admixta, D. effusa.*

DILLENIACEAE — see *Hibbertia.*

Diuris sulphurea R. Br. forma *immaculata* Gandoger, forma *tasmanica* Gandoger.

Dryandra floribunda R. Br., is a synonym of *D. sessilis* (Knight) Domin.

D. sessilis (Knight) Domin, see *D. cygnorum, D. quinquedentata.*

Echinopogon ovatus Beauv., see *E. virens.*

Enchylaena tomentosa R. Br., see *E. brevifolia, E. falcatula, E. patens.*

EPACRIDACEAE — see *Epacris, Leucopogon.*

Epacris impressa Labill. forma *diemenica* Gandoger, forma *lucida* Gandoger, forma *milliganii* Gandoger.

E. microphylla R. Br., see *E. leptalea, E. longespinulosa, E. maidenii, E. walteri.*

Eremophila brownii var. *viridiflora* F. Muell., see note under *E. chlorella.*

E. glabra (R. Br.) Ostenf., see *E. chlorella.*

Eriostemon correifolius (A. Juss.) F. Muell., see note under *E. spathulifolius.*

Erythraea australis R. Br., see note under *Erythraea cymuligera.*

EUPHORBIACEAE — see *Ricinocarpos.*

Euphrasia brownii F. Muell., see notes under *E. crassiuscula, E. deflexifolia, E. maidenii, E. novae-cambriae, E. tasmanica, E. trichocalycina, E. walteri.*

E. collina R. Br., see *E. trichocalycina, E. walteri.*

E. glacialis Wettst. var. *glacialis*, see *E. maidenii.*

E. glacialis var. *eglandulosa* J.H. Willis, see *E. crassiuscula.*

E. gunnii Du Rietz, see notes under *E. deflexifolia* and *E. tasmanica.*

E. speciosa R. Br. s. lat., see *E. novae-cambriae, E. trichocalycina, E. walteri.*

GENTIANACEAE — see *Erythraea.*

GERANIACEAE — see *Geranium.*

Geranium dissectum forma *tasmanicum* Gandoger.

GRAMINEAE — see *Amphipogon, Echinopogon, Zoysia.*

Grevillea aquifolium Lindl., see notes under *G. approximans* and *G. longistyla.*

G. ilicifolia (R. Br.) R. Br., see *G. approximata.*

G. laurifolia Sieber ex Schultes et Schultes f., see *G. amplifolia, G. cordigera.*

G. parviflora R. Br., see *G. alpivaga, G. neurophylla, G. patulifolia.*

G. phylicoides R. Br., see *G. scabrifolia* and note under *G. walteri.*

G. quercifolia R. Br., see *G. glaucina, G. lactucifolia.*

G. sphacelata R. Br., see *G. walteri.*

G. steiglitziana Wakefield, see *G. longistyla.*

Hakea dactyloides (Gaertn.) Cav., see *H. incrassans, H. laevipes, H. leucopoda.*

H. eriantha R. Br., see *H. betchei, H. cymbocarpa, H. eucalpytiformis, H. glaucina, H. recondita.*

H. leucoptera R. Br., see *H. florigera* and note under *H. glabriflora.*

H. microcarpa R. Br., see *H. glabriflora.*

H. rostrata F. Muell. ex Meisn., see *H. lurida* and note under *H. longispina.*

H. salicifolia (Vent.) B.L. Burtt, see *H. amplifolia.*

H. saligna R. Br. is a synonym of *H. salicifolia* (Vent.) B.L. Burtt.

H. sericea Schrad., see *H longispina.*

Helichrysum semipapposum (Labill.) DC. forma *abrotaniforme* Gandoger, forma *adonidiforme* Gandoger, forma *hirtoviscosum* Gandoger, forma *maidenii* Gandoger, forma *porrectum* Gandoger, forma *readeri* Gandoger, forma *sarcodes* Gandoger, forma *sulcaticaule* Gandoger, forma *tasmanicum* Gandoger.

Hibbertia fasciculata forma *adunca* Gandoger, forma *spiceri* Gandoger.

H. stricta R. Br. forma *cinerea* Gandoger, forma *glabra* Gandoger, forma *gunnii* Gandoger, forma *rosmarinifolia* Gandoger.

Isopogon anethifolius (Salisb.) Knight, see *I. confertus*, *I. eriophorus*, *I. globosus*, *I. virgatulus.*

I. ceratophyllus R. Br., see *I. cornu–damae*, *I. scaberulus.*

I. sphaerocephalus Lindl., see *I. eriocladus*, *I. ovoideus.*

JUNCACEAE — see *Luzula.*

JUNCAGINACEAE — see *Triglochin.*

Kennedia prostrata R. Br., see *K. laevipes.*

Kochia villosa var. *tenuifolia* F. Muell. ex Benth., see *Enchylaena decalvans.*

Kunzea muelleri Benth., see *K. glabriuscula.*

LABIATAE (*LAMIACEAE*) — see *Prostanthera*, *Westringia.*

Lambertia formosa Sm., see *L. barbata*, *L. proxima.*

Leptospermum lanigerum (Ait.) Sm., see *L. subargenteum.*

L. pubescens Lam., see note under *L. subargenteum.*

Leucopogon collinus R. Br. forma *cinereus* Gandoger, forma *spicigerus* Gandoger, forma *thymifolius* Gandoger.

L. ericoides R. Br., see *Leucopogon milliganii.*

L. gelidus (Benth.) Wakefield, see *Monotoca concolor.*

L. parviflorus (Andr.) Lindl., see *L. cygnorum.*

L. pulchellus Sond., see *L. glabratus*, *L. morrisonii.*

L. richei R. Br. is a synonym of *L. parviflorus* (Andr.) Lindl.

Lilaeopsis polyantha (Gandoger) Hj. Eichler, see *Crantzia polyantha.*

LILIACEAE — see *Burchardia*, *Caesia*, *Chamaescilla*, *Dianella*, *Stypandra.*

Lomandra leucocephala R. Br. ssp. *leucocephala*, see *Xerotes fibrillosa.*

L. leucocephala ssp. *robusta* Lee, see *Xerotes apiculata.*

Lomatia longifolia R. Br. is a synonym of *L. myricoides* (Gaertn. f.) Domin.

L. myricoides (Gaertn. f.) Domin, see *L. arguta*, *L. densa*, *L. fallacina*, *L. praelonga*, *L. stenophylla.*

Luzula campestris DC., mentioned under *L. novae-cambriae.*

L. meridionalis var. *flaccida* (Buch.) Nordenskiöld, see *L. novae-cambriae.*

L. oldfieldii var. *angustifolia* Nordenskiöld, see *L. novae-cambriae.*

Melaleuca bracteata F. Muell., see *M. glaucocalyx.*

M. parviflora Lindl., mentioned under *M. glaucocalyx.*

Microseris forsteri Hook. f. is a synonym of *M. scapigera* (Soland. ex **A.** Cunn.) Schultz-Bip.

M. scapigera (Soland. ex A. Cunn.) Schultz-Bip., see *M. latifolia*, *M. obtusifolia*, *M. tasmanica*, *M. tenuicula*, *M. walteri*.

Millotia tenuifolia Cass., see *M. hispidula*.

MONIMIACEAE — see *Atherosperma*.

Monotoca elliptica R. Br., mentioned under *Monotoca concolor*.

MYOPORACEAE — see *Eremophila*.

MYRTACEAE — see *Kunzea*, *Leptospermum*, *Melaleuca*, *Tristania*.

Olearia ramulosa forma *arborescens* Gandoger, forma *deflexifolia* Gandoger, forma *obovata* Gandoger, forma *rosmarinoides* Gandoger, forma *simsonii* Gandoger, forma *spiceri* Gandoger.

ORCHIDACEAE — see *Diuris*.

PAPILIONACEAE — see *Pultenaea*, *Kennedia*.

Parahebe derwentiana (Andr.) Briggs et Ehrendorfer, see *Veronica maideniana*.

Persoonia chamaepeuce Lhotsky ex Meisn., see *P. effusa*, *P. myrioclada*, *P. viridula*, also mentioned under *P. recedens*.

P. ferruginea Sm. is a synonym of *P. laurina* Pers.

P. juniperina Labill., see *P. adjacens*, *P. latiuscula*, *P. porrigens*, *P. tasmanica*.

P. laurina Pers., see *P. maidenii*, *P. monticola*.

P. linearis Andr., see *P. breviuscula*, *P. phyllostachys*, *P. walteri*.

P. nutans R. Br., see *P. recedens*.

P. pinifolia R. Br., see *P. patulifolia*, *P. pervagans*.

Petrophile biloba R. Br., see *P. argyrotricha*, *P. chrysotricha*.

P. pedunculata R. Br., see *P. bakerana*, *P. obtusifolia*.

P. striata R. Br., see *P. dasyclada*, *P. stylaris*.

Pimela axiflora F. Muell., see *P. crassifolia*, *P. walteri*.

P. axiflora var. *alpina* F. Muell. ex Benth., see *P. crassifolia*.

P. curviflora var. *pedunculata* Benth., see *P. strigosa*.

P. humilis R. Br., see *P. exulifolia*, *P. tasmanica*.

POACEAE — see *GRAMINEAE*.

Podolepis acuminata R. Br. is a synonym of *P. jaceoides* (Sims) Voss.

P. jaceoides (Sims.) Voss, see *P. laevigata*, *P. papillosa*.

POLYGALACEAE — see *Comesperma*.

POTAMOGETONACEAE — see *Potamogeton*.

P. natans L., see note under *P. odontocarpus*.

P. tricarinatus F. Muell. et A. Benn. ex A. Benn., see *P. odontocarpus*.

Prostanthera aspalathoides A. Cunn. ex Benth., see *P. eriocalyx*, *P. patula*.

P. coccinea F. Muell., see note under *P. eriocalyx*, *P. patula*.

PROTEACEAE — see *Conospermum*, *Dryandra*, *Grevillea*, *Hakea*, *Isopogon*, *Lambertia*, *Lomatia*, *Persoonia*, *Petrophile*.

PSILOTACEAE — see *Psilotum*.

Psilotum nudum (L.) Griseb., see *P. flabellatum*.

PTERIDACEAE — see *Pteris.*

PTERIDOPHYTA — see *Asplenium, Pteris, Davallia.*

Pteridium esculentum (Forst. f.) Cockayne, see note under *Pteris esculenta* Forst. f.

Pteris esculenta forma *australiensis* Gandoger, forma *coriacea* Gandoger, forma *elongella* Gandoger.

Ptilotus obovatus (Gaudich.) F. Muell., see *P. oblongifolius.*

Pultenaea gunnii Benth., see *P. tasmanica.*

P. gunnii var., *baeckeoides* Rodway, mentioned under *P. tasmanica.*

Rhagodia billardieri R. Br., see note under *R. cygnorum.*

R. radiata Nees, see *R. cygnorum.*

Ricinocarpos pinifolius Desf., see *R. megalanthus, R. proximus.*

ROSACEAE — see *Acaena, Rubus.*

Rubus × *novae-cambriae* Gandoger, possibly a correct name for a hybrid.

R. parvifolius L., see *R.* × *novae-cambriae, R. simsonianus, R. tasmanicus R. walteranus.*

RUTACEAE — see *Eriostemon.*

SANTALACEAE — see *Santalum.*

Santalum acuminatum (R. Br.) DC. see *S. densiflorum.*

S. lanceolatum R. Br., see *S. leptocladum, S. megacarpum.*

SCROPHULARIACEAE — see *Euphrasia, Veronica.*

SOLANACEAE — see *Anthocercis.*

Spergularia media forma *diemenica* Gandoger.

Stypandra caespitosa R. Br., see *S. juncinella.*

S. caespitosa var. *umbellata* (R. Br.) F. Muell., see note under *S. juncinella.*

S. glauca R. Br., see *S. graminea, S. laeta, S. latifolia.*

Styphelia gelida (Benth.) J.H. Willis, see note under *Monotoca concolor.*

THYMELAEACEAE — see *Pimelea.*

Triglochin striata Ruiz et Pavon, see *T. pycnostachys.*

Trisetum spicatum (L.) Richt., see *T. maidenii, T. subspicatum* forma *maidenii.*

T. spicatum var. *maidenii* (Gandoger) Fernald, see note under *T. subspicatum* forma *maidenii.*

Tristania laurina (Sm.) R. Br., see *T. bakerana.*

UMBELLIFERAE — see *Lilaeopsis, Xanthosia.*

Veronica derwentiana Andr., see note under *V. maideniana.*

Westringia rigida R. Br., see *W. lurida.*

XANTHORRHOEACEAE — see *Xerotes.*

Xanthosia pilosa Rudge, see *X. tasmanica.*

Xerotes leucocephala R. Br., see note under *X. apiculata* and *X. fibrillosa.*

Zoysia macrantha Desv., see *Z. iodostachys.*

Z. pungens Willd., see note under *Z. iodostachys.*

CATALOGUE OF NAMES

(Names with the rank of *forma* have not been critically assessed, and it should not be assumed that these names are correct)

Acaena agnipila Gandoger in Bull. Soc. Bot. France LIX (1912) 707, a correct name.

Holotype: New South Wales, Sunny Corner, Boorman 11. 1899 (ex National Herbarium of N.S.W.) Not seen.

Isotype: NSW 95900. See Orchard (1969).

Acaena dumulosa Gandoger ibid. 706.

— **A. anserinifolia** (Forst. et Forst. f.) Druce sens. lat.

Type: New South Wales, Sunny Corner, Maiden (ex National Herbarium of N.S.W.). Not seen. See Orchard (1969) 93.

Acaena pennatula Gandoger ibid. 707.

— **A. echinata** var. **subglabricalyx** (Bitter) Orchard.

Type: Victoria, Walter s.n. (ex Herb. Walter). Not seen. See Orchard (1969 93, 101.

Acaena tasmanica Gandoger ibid. (1912) 706, non Bitter (1911).

— **A. ? montana** Hook. f.

Type: Tasmania, Simson s.n. (ex Herb. Spicer). Not seen. See Orchard (1969) 93.

Amphipogon elatior Gandoger in Bull. Soc. Bot. France LXVI (1919) 298.

— **A. strictus** R. Br. var. **strictus.**

Holotype: New South Wales, Barbers ('Babers') Creek, Maiden s.n., 1899 (ex Herbarium, Botanic Gardens, Sydney). NSW 2155 is a good match for the type.

(J. W. Vickery)

Amphipogon imbricatus Gandoger ibid. 298.

— **A. strictus** R. Br. var. **strictus.**

Holotype: New South Wales, Mt. Victoria, Maiden 12. 1896 (ex Herbarium, Botanic Gardens, Sydney).

Isotypes: NSW 2159, NSW 2161 (portion of this is at Kew).

(J. W. Vickery)

Anthocercis genistifolia Gandoger in Bull. Soc. Bot. France LXV (1918) 69.

— Probably originally determined as *A. eadesii* F. Muell., '*Endesii*'. *A. eadesii* is now regarded as a synonym of *A. frondosa* (Miers) J.M. Black.

Type: New South Wales (ex Herb. Walter). Not seen.

Anthocercis tenuipes Gandoger ibid. 69.

— **A. frondosa** (Miers) J.M. Black, originally determined as *A. eadesii* F. Muell., '*Endesii*'.

Type: New South Wales, Nepean River, Maiden (ex Herbarium, Botanic Gardens, Sydney). Not seen.

Isotype: NSW 121158 (collector: Forsyth).

Asplenium flabellifolium forma *tasmanicum* Gandoger in Bull. Soc. Bot. France XLVII (1900) 308.

Syntypes: Tasmania, Huon ('Huron'), Winton, etc., Spicer (ex Herb. Spicer).

The type collections of f. *tasmanicum* have not been examined but from Gandoger's description this form does not appear to be worthy of recognition.

(M. D. Tindale)

Astrotricha obtusifolia Gandoger in Bull. Soc. Bot. France LIX (1912) 709 '*Asterotricha*'.

— **A. ledifolia** DC.

HOLOTYPE: New South Wales, Delegate Mountain, Baker (ex Technological Museum, Sydney). Not seen.

ISOTYPE: NSW 125806 (collector Bäuerlen, 1.1899).

(A.N. Rodd)

Atherosperma

The four types of Gandoger's names in this genus have been examined by Dr R. Schodde in Canberra, and he has kindly confirmed the tentative determinations made in Sydney (pers. comm.).

Atherosperma dilatatum Gandoger in Bull. Soc. Bot. France LXVI (1919) 233.

— **A. moschatum** Labill.

HOLOTYPE: Victoria, Launching ('Lunching') Place, Coghill.

Atherosperma elongatum Gandoger ibid. 232.

— **A. moschatum** Labill.

HOLOTYPE: New South Wales, Blue Mountains, Maiden.

Atherosperma muticum Gandoger ibid. 232.

— **A. moschatum** Labill.

HOLOTYPE: Victoria, Walter (ex Herb. Walter).

Atherosperma tasmanica Gandoger ibid. 233.

— **A. moschatum** Labill.

HOLOTYPE: Tasmania, Gunn s.n. (probably ex Herb. Spicer).

Bauera glabriflora Gandoger in Bull. Soc. Bot. France LIX (1912) 709.

— **B. rubioides** Andr.

SYNTYPES: New South Wales, Mount Wilson, Maiden; Mount Wilson, Gregson ('Greysow') (ex National Herbarium of N.S.W.). Not seen.

There are no isotypes at the National Herbarium of N.S.W. Knowing Gandoger's method of citation, it is possible that there is but a holotype collected by Gregson.

Burchardia rigida Gandoger in Bull. Soc. Bot. France LXVI (1919) 293, '*Burckhardia*'.

— **B. umbellata** R. Br.

HOLOTYPE: Western Australia, Darlington, Morrison. Not seen.

Caesia cygnorum Gandoger ibid. 292.

— **C. parviflora** R. Br.

HOLOTYPE: Western Australia, Cottesloe, mouth of Swan River, Morrison 10.1900 (ex Herb. Morrison). NSW 120959 is a good match for the type.

(A.N. Rodd)

Caesia dichotomizans Gandoger ibid. 292.

— **C. parviflora** R. Br.

HOLOTYPE: Victoria, Walter s.n., 1902 (ex Herb. Walter).

NSW 120960 (Victoria, Dividing Ranges, Walter 11.1898) is a good match for the type, and may possibly be an isotype.

(A.N. Rodd)

Cardamine tasmanica Gandoger in Bull. Soc. Bot. France XLVII (1900) 305.

— originally misdetermined as *C. hirsuta* L. The Australian species formerly referred to *C. hirsuta* are under revision.

Syntypes: Tasmania, Thomn's Plains, Simson 512; Humburg Point, Georges Bay, Simson 191; Stony Steps et Winton, Spicer (all ex Herb. Spicer). The spelling of locality names may be incorrect. Not seen.

(L.A.S. Johnson)

Carex maidenii Gandoger in Bull. Soc. Bot. France XLVI (1899) 392.

— **C. gaudichaudiana** Kunth, originally misdetermined as *C. caespitosa* L.

Holotype: New South Wales, Mt. Kosciusko, Maiden 1.1899 (ex Herbarium, Botanic Gardens, Sydney). Not seen. There is no specimen at the National Herbarium of N.S.W. agreeing with Gandoger's description, though it does appear to apply to one of the small highland forms of *C. gaudichaudiana;* Maiden (1903) 172 is most definite about this – "L'espèce en question est, sans aucun doute, d'après les meilleures autorités (pasteur Kükenthal et M. Kneucker), le C. Gaudichaudiana Kunth".

For a last word see Gandoger (1906) 532, in which he claims that he was originally misled by a misdetermination made at Sydney.

The specimen sent from LYON in response to our request for the type is a specimen of *Carex hebes* Nelmes (1939), originally sent to Gandoger as *Carex canescens* L. (Mt Kosciusko, Maiden & Forsyth 1.1899). This cannot be the type of *C. maidenii* since it disagrees with the description in a number of obvious points, and is annotated by Gandoger as *Carex divisa* Huds.

(L.A.S. Johnson)

Carpha tasmanica Gandoger in Bull. Soc. Bot. France LXVI (1919) 297.

— **C. alpina** R. Br.

Holotype: Tasmania, Mt. Wellington, Lucas 1.1901 (ex National Herbarium of N.S.W.).

Isotype: NSW 120927.

(W.–L. Chew)

Caustis tenuirama Gandoger ibid. 297.

— **C. flexuosa** R. Br.

Holotype: Queensland, 1902 (ex Herb. Walter).

(W.–L. Chew)

Chamaescilla tasmanica Gandoger ibid. 291.

— **C. corymbosa** F. Muell. ex Benth.

Holotype: Tasmania, 1902 (ex Herb. Walter).

(A.N. Rodd)

Chenopodium lycioides Gandoger ibid. 224.

— **C. nitrariaceum** F. Muell.

Holotype: Victoria, Warracknabeal, Reader 10.1903 (ex National Herbarium of Victoria).

(L.A.S. Johnson)

Chenopodium ulicinum Gandoger ibid. 224, a correct name; see plate XXVIII.

Holotype: South Australia, Mt. Lyndhurst, Koch 366, 4.1900, originally determined as *C. nitrariaceum* F. Muell. NSW 90447 is a good match for the type.

(L.A.S. Johnson)

Comesperma ericinum DC.

forma *aristulosum* Gandoger in Bull. Soc. Bot. France LX (1913) 456.

SYNTYPES: Queensland, Walter (ex Herb. Walter); Victoria, in alpibus, Walter, Reader, MacLean, etc. Not seen.

forma *esulifolium* Gandoger ibid. 456.

TYPE: New South Wales, summit of Mt. Warning, Forsyth 11.1898 (ex National Herbarium of N.S.W.). Not seen.

ISOTYPE: NSW 120784.

forma *tasmanicum* Gandoger ibid. 456.

TYPE: Tasmania, Spicer (ex Herb. Spicer). Not seen.

forma *uncinatum* Gandoger ibid. 456.

TYPE: New South Wales, Baker s.n. (probably ex Technological Museum, Sydney). Not seen.

Van Steenis (1968) 382 remarks: – "Several names [in *Comesperma*] have been proposed by Gandoger, Bull. Soc. Bot. Fr. 60 (1913) 456, and one by Hasskarl, but I refrain from transferring these names [to *Bredemeyera*], as to all probability they will prove to be synonyms".

Conospermum cucullatum Gandoger in Bull. Soc. Bot. France LXVI (1919) 231.

— **C. patens** Schlechtd.

HOLOTYPE: South Australia, Highbury, Maiden s.n., 1901 (ex Herbarium, Botanic Gardens, Sydney).

(L.A.S. Johnson & D.J. McGillivray)

Conospermum elegantulum Gandoger ibid. 231.

— **C. stoechadis** Endl. var. **stoechadis.**

HOLOTYPE: Western Australia, Lower Canning River, Morrison 10.1899 (ex Herb. Morrison).

Conospermum helichrysoides Gandoger ibid. 231.

— **C. patens** Schlechtd.

HOLOTYPE: New South Wales [sphalm.], 1902 (ex Herb. Walter). This specimen was collected in Victoria or South Australia.

(L.A.S. Johnson & D.J. McGillivray)

Conospermum proximum Gandoger ibid. 231.

— **C. stoechadis** Endl. var. **stoechadis.**

LECTOTYPE: Western Australia, Serpentine, Menzel 83, 9.1898 (ex Herb. Menzel).

ISOLECTOTYPE: NSW 91778.

SYNTYPE: Western Australia, 1902 (ex Herb. Walter).

The lectotype has both flowers and leaves, and bears a label annotated by Gandoger.

Conospermum scolopendrinum Gandoger ibid. 232.

— **C. longifolium** Sm.

HOLOTYPE: New South Wales, Port Jackson, Tovey 10.1898 (ex National Herbarium of Victoria).

(L.A.S. Johnson & D.J. McGillivray)

Conospermum scorzonerifolium Gandoger ibid. 232.

— **C. longifolium** Sm.

HOLOTYPE: New South Wales, Blue Mountains, Bäuerlen ('Baker') 8.1899 (ex Technological Museum, Sydney as n. 2406, possibly a Bäuerlen collection number).

(L.A.S. Johnson & D.J. McGillivray)

Crantzia polyantha Gandoger in Bull. Soc. Bot. France LXV (1918) 31.

— **Lilaeopsis polyantha** (Gandoger) Hj. Eichler.

HOLOTYPE: New South Wales, Betche ('Maiden'). Not seen.

Hill (1927) 547 cites a collection, Walcha district, Betche 12.1898, which he saw from Gandoger's herbarium, and from the Herbarium, Botanic Gardens, Sydney. Also see Eichler (1963) 296.

ISOTYPE: NSW 121157.

(A.N. Rodd)

Davallia cristatella Gandoger in Bull. Soc. Bot. France LXVI (1919) 306.

— **Culcita dubia** (R. Br.) Maxon, originally determined as *Davallia dubia* R. Br.

HOLOTYPE: Victoria, Mueller s.n., 1875 (ex Phytologic Museum of Melbourne) central specimen.

The type is merely an aberrant specimen in which the pinnae have crested apices.

(M.D. Tindale)

Davallia muelleri Gandoger ibid. 306.

— **Culcita dubia** (R. Br.) Maxon, originally determined as *Davallia dubia* R. Br.

HOLOTYPE: New South Wales, New England, Stuart ('Mueller') s.n., 1875 (ex Phytologic Museum of Melbourne). NSW P5352 is a good match for the type.

(M.D. Tindale)

Davallia tasmanica Gandoger ibid. 306.

— **Culcita dubia** (R. Br.) Maxon, originally determined as *Davallia dubia* R. Br.

SYNTYPES: Tasmania, Lodder s.n., 1876 (probably ex Herb. Spicer); Tasmania, Goulds Country ('Gould's C.'), Simson 10.1875 (ex Herb. Spicer).

The second cited syntype is a reasonably good match for NSW P2363 except that the pinnules are more hirsute in the latter specimen.

(M.D. Tindale)

Dianella admixta Gandoger ibid. 289.

— **D. revoluta** R. Br.

SYNTYPES: New South Wales, Barbers Creek, Maiden 10.1899 (ex Herbarium, Botanic Gardens, Sydney. On the specimen is a small green tag with the number 145); Victoria, 1902 (ex Herb. Walter).

ISOSYNTYPE: NSW 121152 (Barbers Creek, Rumsey). A good match for the other syntype is NSW 121151, a collection from Wando Vale, Victoria.

(A.N. Rodd)

Dianella effusa Gandoger ibid. 289.

— **D. revoluta** R. Br.

SYNTYPES: South Australia, Flinders Range, Koch 287, 10.1901; Western Australia, Darling Range at Smith's Mill, Morrison 11.1899 (ex Herb. Morrison).

ISOSYNTYPE: Koch 287 at NSW.

(A.N. Rodd)

Diuris sulphurea R. Br., '*sulfurea*'.

forma *immaculata* Gandoger in Bull. Soc. Bot. France XLVII (1900) 307, '1°f. *immaculata*'.

TYPE: Tasmania, Winton, Spicer (ex Herb. Spicer). Not seen.

forma *tasmanica* Gandoger ibid. 307, '2°f. *tasmanica*'.

SYNTYPES: Tasmania, Launceston, Gunn 932; Georges Bay, Simson 709; Oyster Cove ('Gyster Oove') Milligan 937 (all ex Herb. Spicer). Not seen.

Dryandra cygnorum Gandoger in Bull. Soc. Bot. France LXVI (1919) 230.

— **D. sessilis** (Knight) Domin, originally determined as *D. floribunda* R. Br.

HOLOTYPE: Western Australia, Melville Park, Lower Swan River, Morrison 7.1897 (ex Herb. A. Morrison).

When comparing the two type specimens of *Dryandra* with the descriptions it was found that the label for the type of *D. cygnorum* is attached to the sheet bearing the type of *D. quinquedentata* and vice versa.

Dryandra quinquedentata Gandoger ibid. 230.

— **D. sessilis** (Knight) Domin, originally determined as *D. floribunda* R. Br.

HOLOTYPE: Western Australia, Swan River, Lea s.n., 1902 (ex Herbarium of the Department of Agriculture, W.A., and sent to Gandoger from the Botanic Gardens, Sydney).

The label for this specimen is attached to the sheet bearing the type of *D. cygnorum.* NSW 119053 is a good match for the type of *D. quinquedentata.*

Echinopogon virens Gandoger ibid. 300.

— **E. ovatus** Beauv. ('Palis.').

HOLOTYPE: New South Wales, Walcha, Maiden 12.1898 (ex Herbarium, Botanic Gardens, Sydney). NSW 100654 is a good match for the type. A specimen from Walcha, Betche 12.1898 (NSW 100655) is probably part of the same general collection, but appears to have come from another plant. It is certainly conspecific. The Holotype and an Isotype in the Kew Herbarium were examined by C.E. Hubbard in December 1934 and determined as *E. ovatus* Beauv.; see Hubbard (1935a) 9.

(J.W. Vickery)

Enchylaena brevifolia Gandoger ibid. 224.

— **E. tomentosa** R. Br.

HOLOTYPE: New South Wales, Cobar, Boorman ('Boormun') 7.1903 (ex National Herbarium of N.S.W.).

ISOTYPE: NSW 120756.

(J.C. De Nardi)

Enchylaena decalvans Gandoger ibid. 224.

— **Kochia villosa** var. **tenuifolia** F. Muell. ex Benth., originally determined as *Kochia villosa* Lindl. and redetermined as *Enchylaena tomentosa* R. Br. by Gandoger.

HOLOTYPE: Victoria, Wimmera, Reader 3/1, 1896 (Jan. or Mar.?).

Wilson in Eichler Suppl. Fl. S. Austral. (1965) 125 states: "... this plant (*Kochia villosa* var. *tenuifolia*) merits specific status. . ."

Enchylaena falcatula Gandoger ibid. 224.

— **Bassia diacantha** (Nees) F. Muell.

HOLOTYPE: Victoria, 1902 (ex Herb. Walter).

The specimen at lower right of the sheet is probably *Enchylaena tomentosa.* A lectotypification of the name *Enchylaena falcatula* would be desirable.

Enchylaena patens Gandoger ibid. 224.

— **E. tomentosa** R. Br.

TYPE SHEET: South Australia, Mt. Lyndhurst, Koch 120, 5.1900; Mt. Lyndhurst Koch 120, 10.1899 ('Mt. Lyndhorst').

There are two labels and four specimens on the type sheet but it is impossible to assign labels to specimens. However there is no doubt that this sheet bears the type material.

(J.C. De Nardi)

Epacris impressa Labill.

forma *diemenica* Gandoger in Bull. Soc. Bot. France XLVII (1900) 307, '3°f. *diemenica*'.

Syntypes: Tasmania, Huon Road, Tollgate et Cascades, Spicer; Georges Bay, Simson 16 (all ex Herb. Spicer). Not seen.

forma *lucida* Gandoger ibid. 307, '2°f. *lucida*'.

Type: Tasmania, Mount Ramsay, Scott (ex Herb. Spicer). Not seen.

forma *milliganii* Gandoger ibid. 307, '1°f. *Milligani*'.

Type: Tasmania, Oyster Cove, Milligan 865 (ex Herb. Spicer). Not seen.

Epacris leptalea Gandoger in Bull. Soc. Bot. France LXV (1918) 55.

— **E. microphylla** R. Br.

Holotype: Queensland, 1902 (ex Herb. Walter).

Epacris longespinulosa Gandoger ibid. 56.

— **E. microphylla** R. Br.

Holotype: Victoria, near Buchan, Audas 9.1910 (ex National Herbarium of Victoria).

Epacris maidenii Gandoger ibid. 55.

— **E. microphylla** R. Br.

Holotype: New South Wales, Port Jackson District, Maiden 10.1898 (ex Herbarium, Botanic Gardens, Sydney).

Epacris walteri Gandoger ibid. 56.

— **E. microphylla** R. Br.

Holotype: Victoria, Buffalo Mts, Walter 11.1903 (ex Herb. Walter).

Eremophila chlorella Gandoger ibid. 64.

— **E. glabra** (R. Br.) Ostenf., originally determined as *E. brownii* var. *viridiflora* F. Muell.

Holotype: Western Australia, Lower Canning River, Morrison 6.1899 (ex Herb. Morrison).

(B.G. Briggs)

Eriostemon spathulifolius Gandoger in Bull. Soc. Bot. France LX (1913) 458.

— **Asterolasia asteriscophora** (F. Muell.) Druce, originally determined as *Eriostemon correifolius* (A. Juss.) F. Muell.

Holotype: Victoria, Emerald ('Esmerald'), MacLennan. Not seen.

According to Wilson (1970) 120: ". . . the description agrees with a form of *Asterolasia* found at Emerald in the Dandenong Ranges of Victoria. This form was included under "*Asterolasia muelleri* Benth." by Ewart, Fl. Vict. 703 (1931) [≡*A. asteriscophora* (F. Muell.) Druce], but it may deserve recognition as a distinct species under *Urocarpus*".

Erythraea cymuligera Gandoger in Bull. Soc. Bot. France LXV (1918) 60.

— **Centaurium tenuiflorum** (Hoffmannsegg et Link) Fritsch, originally determined as *Erythraea australis* R. Br.

Holotype: Western Australia, Darlington, Darling Range, Morrison 12.1903 (ex Herb. Morrison).

Isotype: NSW 120757 (Morrison 13311).

(L.A.S. Johnson)

Euphrasia crassiuscula Gandoger in Bull. Soc. Bot. France LXVI (1919) 218.

— **E. glacialis** var. **eglandulosa** J.H. Willis, originally determined as *E. brownii* F. Muell.

HOLOTYPE: Victoria, 1902 (ex Herb. Walter), specimen on the right. The specimen at the left of the sheet is not an *Euphrasia.*

Willis (1967) 147 states: – "It is certain that the inadequately described *E. crassiuscula* Gandoger (1919) is identical [with *E. glacialis* var *eglandulosa*]". On the label and beneath the name *Euphrasia brownii* F. Muell., Gandoger has made the following annotation: – "f. flores pallida, folia crassa lata".

(B.G. Briggs)

Euphrasia deflexifolia Gandoger ibid. 218.

— possibly conspecific with *E. tasmanica* Gandoger and *E. gunnii* Du Rietz (1948) 355, originally determined as *E. brownii* F. Muell.

HOLOTYPE: Tasmania, Coast Road near Scamander River, Simson 402, 9.1876 (ex Herb. Spicer).

(B.G. Briggs)

Euphrasia maidenii Gandoger ibid. 218, see plate XXX.

— **E. glacialis** Wettst. var. **glacialis,** originally determined as *E. brownii* F. Muell.

HOLOTYPE: New South Wales, Mount Kosciusko, Maiden & Forsyth ('Maiden') 1.1899 (ex Herbarium, Botanic Gardens, Sydney).

(B.G. Briggs)

Euphrasia novae–cambriae Gandoger ibid. 218, '*Novae Cambriae*'.

— **E. speciosa** R. Br. sens. lat., originally determined as *E. brownii* F. Muell.

HOLOTYPE: New South Wales, Sydney, Baker 9.1896 (ex Technological Museum, Sydney).

(B.G. Briggs)

Euphrasia tasmanica Gandoger ibid. 218.

— possibly conspecific with *E. deflexifolia* Gandoger and *E. gunnii* Du Rietz (1948) 355, originally determined as E. *brownii* F. Muell.

HOLOTYPE: Tasmania, Georges Bay, Simson 58, 9.1875 (ex Herb. Spicer).

(B.G. Briggs)

Euphrasia trichocalycina Gandoger ibid. 218.

— the names *E. collina* R. Br. and *E. speciosa* R. Br. sens. lat. are applied to material resembling the type of *E. trichocalycina*, and there is doubt as to the limits of these taxa and which name should be applied; originally determined as *E. brownii* F. Muell.

HOLOTYPE: Victoria, 1902 (ex Herb. Walter). Beside the original determination Gandoger has added the annotation "f. pubicalyx".

(B.G. Briggs)

Euphrasia walteri Gandoger ibid. 218.

— The names *E. collina* R. Br. and *E. speciosa* R. Br. sens. lat. are applied to material resembling the type of *E. walteri*, and there is doubt as to the limits of these taxa and which names should be applied; originally determined as *E. brownii* F. Muell.

HOLOTYPE: Victoria, 1902 (ex Herb. Walter).

ISOTYPE: NSW 10945 (collected 9.1898).

Under the original determination Gandoger has added the annotation "f. leiocalyx".

(B.G. Briggs)

Geranium dissectum L.

forma *tasmanicum* Gandoger in Bull. Soc. Bot. France XLVII (1900) 306, '*tasmanica*'.

SYNTYPES: Tasmania, Southport, Woods; Stone Pit Chapel, Spicer; Georges Bay, Simson 187 (all ex Herb. Spicer). Not seen.

Grevillea alpivaga Gandoger in Bull. Soc. Bot. France LXVI (1919) 231.

— **G. parviflora** R. Br.

HOLOTYPE: Victoria, Vict. Alps, Walter 11.1903 (ex Herb. Walter), specimen on the right of the sheet, labelled "A". Part of NSW 94135 is a good match for the type.

The specimen on the left of the sheet is *Grevillea pilulifera* (Lindl.) Druce, a species native to Western Australia.

Grevillea amplifolia Gandoger ibid. 231.

— **G. laurifolia** Sieber ex Schultes et Schultes f.

LECTOTYPE: New South Wales, Blue Mountains, Bäuerlen ('Baker') 8.1899 (ex Technological Museum, Sydney, as No. 2414, possibly a Bäuerlen collection number).

SYNTYPE: New South Wales, Blue Mountains, Maiden 10.1898 (ex Herbarium, Botanic Gardens, Sydney).

Grevillea approximata Gandoger ibid. 231.

— **G. ilicifolia** (R. Br.) R. Br., originally determined as *G. aquifolium* Lindl.

HOLOTYPE: Victoria, 1902 (ex Herb. Walter), specimen on the right of the sheet. The specimen on the left is *G. steiglitziana* and probably part of the type of *G. longistyla* Gandoger.

Grevillea cordigera Gandoger ibid. 231.

— **G. laurifolia** Sieber ex Schultes et Schultes f.

HOLOTYPE: New South Wales, 1902 (ex Herb. Walter).

Grevillea glaucina Gandoger ibid. 230.

— **G. quercifolia** R. Br.

HOLOTYPE: Western Australia, Mt. Barker, Goadby ('Goudby') 168, 10.1900 (the original determination as *Grevillea quercifolia* is in Ernst Betche's script, but there is no other evidence on the sheet to indicate that Gandoger received it from Sydney, although this seems likely).

Grevillea lactucifolia Gandoger ibid. 230.

— **G. quercifolia** R. Br.

HOLOTYPE: Western Australia, Gooseberry ('Goosberry') Hill, Darling Range, Morrison 9.1900 (ex Herb. Morrison).

Grevillea longistyla Gandoger ibid. 231, non Hook. (1848), see plate XXIX.

— **G. steiglitziana** Wakefield, originally determined as *G. aquifolium* Lindl.

HOLOTYPE: Victoria, Brisbane Ranges, St. John 10.1909 (ex National Herbarium of Victoria).

The specimen on the left of the type sheet of *G. approximata* is probably part of the type material of *G. longistyla* Gandoger. *Grevillea steiglitziana* was described by Wakefield in 1955.

Grevillea neurophylla Gandoger ibid. 231.

— **G. parviflora** R. Br.

HOLOTYPE: Victoria ('Austr. mer.'), 1902 (ex Herb. Walter), specimen labelled "C", at the right of the sheet.

The specimen was collected in Victoria, possibly in the vicinity of Mount Buffalo. Part of NSW 94135 is a good match for the type. Specimen "A" and "B" on the same sheet are also *G. parviflora*, but not associated with the typification of the name *G. neurophylla*.

Grevillea patulifolia Gandoger ibid. 231.

— **G. parviflora** R. Br.

HOLOTYPE: New South Wales, Barbers Creek, Maiden 11.1899 (ex Herbarium, Botanic Gardens, Sydney).

ISOTYPE: NSW 94126 (collector Rumsey).

Grevillea scabrifolia Gandoger ibid. 231.

— **G. phylicoides** R. Br.

HOLOTYPE: New South Wales, Conjola, Heron ('Maiden') 11.1899 (ex Herbarium Botanic Gardens, Sydney).

Grevillea walteri Gandoger ibid. 231.

— **G. sphacelata** R. Br., originally labelled as *G. phylicoides* R. Br., '*phyllicoides*'.

HOLOTYPE: New South Wales, 1902 (ex Herb. Walter).

Hakea amplifolia Gandoger in Bull. Soc. Bot. France LXVI (1919) 229.

— **H. salicifolia** (Vent.) B.L. Burtt, originally determined as *H. saligna* R. Br.

HOLOTYPE: New South Wales, Woodburn, Bäuerlen ('Baker') 10.1896 (ex Technological Museum).

ISOTYPE: NSW 112288.

Hakea betchei Gandoger ibid. 230.

— **H. eriantha** R. Br.

HOLOTYPE: New South Wales, Tenterfield, Betche 10.1886 (ex National Herbarium of N.S.W.).

ISOTYPE: NSW 112291.

Hakea cymbocarpa Gandoger ibid. 230, '*cymbaecarpa*'.

— **H. eriantha** R. Br.

HOLOTYPE: Victoria, near Harrietville, Audas 5.1910 (ex National Herbarium of Victoria).

Hakea eucalyptiformis Gandoger ibid. 230.

— **H. eriantha** R. Br.

HOLOTYPE: New South Wales, Sydney, Baker 6.1893 (ex Technological Museum, Sydney).

Hakea eriantha does not occur near Sydney; the type was probably collected on the south coast or southern tablelands of N.S.W., perhaps by W. Bäuerlen.

Hakea florigera Gandoger ibid. 229.

— **H. leucoptera** R. Br.

LECTOTYPE: South Australia, Mt. Lyndhurst, Koch 80, 10.1899.

SYNTYPE: South Australia (ex Herb. Walter). Not seen.

The lectotype bears a label with the specific name written by Gandoger, and it is not discordant with the description.

Hakea glabriflora Gandoger ibid. 229, see plate XXXI.

— **H. microcarpa** R. Br., originally labelled *H. leucoptera* R. Br.

LECTOTYPE: New South Wales (?), specimen "B" on the sheet labelled Oxley Plains, Betche 12.1885 (ex National Herbarium of N.S.W.). NSW 112287 is a good match for the lectotype.

Specimens labelled "A", "C", and "D" on the type sheet are vegetative pieces of *H. leucoptera* to which the label applies, and with which the flowering specimen of *H. microcarpa* was accidentally included. *Hakea microcarpa* does not occur in the locality shown. As Gandoger's description was based on the flowering specimen the selection of a lectotype was straightforward.

Hakea glaucina Gandoger ibid. 230.

— **H. eriantha** R. Br.

HOLOTYPE: Victoria, near Buchan, Audas 9.1910 (ex National Herbarium of Victoria).

Hakea incrassans Gandoger ibid. 230.

— **H. dactyloides** (Gaertn.) Cav.

HOLOTYPE: New South Wales, Port Jackson District, Michael ('Maiden') 11.1902 (ex Herbarium, Botanic Gardens, Sydney).

Hakea laevipes Gandoger ibid. 230.

— **H. dactyloides** (Gaertn.) Cav.

HOLOTYPE: New South Wales, Bundanoon, Baker 12.1897 (ex Technological Museum, Sydney), specimen at the right of the sheet.

The pedicels are not glabrous as stated in Gandoger's description but have a subsericeous indumentum.

Hakea leucopoda Gandoger ibid. 230.

— **H. dactyloides** (Gaertn.) Cav.

HOLOTYPE: New South Wales, 1902 (ex Herb. Walter).

Hakea longispina Gandoger ibid. 229.

— **H. sericea** Schrad., originally misdetermined as *H. rostrata* F. Muell.

HOLOTYPE: Victoria, 1902 (ex Herb. Walter). NSW 58241 is a good match for the vegetative parts of the type.

Hakea lurida Gandoger ibid. 229.

— **H. rostrata** F. Muell. ex Meisn.

HOLOTYPE: Victoria, Grampians, Williamson 10.1901 (ex National Herbarium of N.S.W.).

ISOTYPE: NSW 112285.

Hakea recondita Gandoger ibid. 230.

— **H. eriantha** R. Br.

HOLOTYPE: Queensland, 1902 (ex Herb. Walter).
The specimen at the left of the sheet is apparently the holotype, although its leaves are nearer to 10 cm than 8 cm in length and mostly in excess of 1·5 cm wide. The specimen on the right has leaves about 1 cm wide, and could not reasonably be associated with the typification of this name.

Helichrysum semipapposum (Labill.) DC.

The following trinomials of *Helichrysum semipapposum* are in accordance with Article 24 of the Code. The application of Article 33 is not relevant, as there is a definite indication that the epithets are to be used in combination with the name

Helichrysum semipapposum, shown in heavy Roman type. This is very similar to the presentation in Gandoger's *Flora Europae*, with the notable exception that in the latter there is no definite indication of rank, (not to be confused with indication of use in combination) whereas here the taxa are defined as *formas vel species secundi ordinis*. The names of these two categories are being treated as synonyms, and this appears to be in accordance with the author's intention (see author's annotations on type sheets of forma *abrotaniforme* and forma *hirtoviscosum*).

Helichrysum semipapposum

forma *abrotaniforme* Gandoger in Bull. Soc. Bot. France LXV (1918) 44.

HOLOTYPE: Victoria, 1902 (ex Herb. Walter).

On the label and beneath the name *Helichrysum semipapposum*, Gandoger has added the annotation 'f. virens glabrata'.

forma *adonidiforme* Gandoger ibid. 44.

HOLOTYPE: South Australia, Flinders Range, Koch 598, 10.1901.

forma *hirtoviscosum* Gandoger ibid. 44.

HOLOTYPE: Victoria, 1902 (ex Herb. Walter).

On the label and beneath the name *Helichrysum semipapposum*, Gandoger has added the annotation "f. hirto-viscosa".

forma *maidenii* Gandoger ibid. 44.

HOLOTYPE: New South Wales, Jenolan Caves, Maiden 11.1899 (ex Herbarium, Botanic Gardens, Sydney).

forma *porrectum* Gandoger ibid. 44.

HOLOTYPE: South Australia, Flinders Range, Koch 10.1901.

forma *readeri* Gandoger ibid. 44.

HOLOTYPE: Victoria, Wimmera ('Vimmera'), Reader 1.1893 (source of material not indicated).

forma *sarcodes* Gandoger ibid. 44.

HOLOTYPE: Victoria, Mentone, Tovey 10.1907 (ex National Herbarium of Victoria).

forma *sulcaticaule* Gandoger ibid. 44.

HOLOTYPE: Victoria, near Harrietville, Audas 6.1910 (ex National Herbarium of Victoria).

forma *tasmanicum* Gandoger ibid. 44.

HOLOTYPE: Tasmania, Simson s.n., 1876 (source not indicated, but probably ex Herb. Spicer).

Hibbertia fasciculata R. Br. ex DC.

forma *adunca* Gandoger in Bull. Soc. Bot. France XLVII (1900) 305, '1°f. *adunca*'.

TYPE: Tasmania, Heathy Valley, Flinders Island, Simson 587 (ex Herb. Spicer). Not seen.

forma *spiceri* Gandoger ibid. 305, '2°f. *Spiceri*'.

TYPE: Tasmania, Brighton (ex Herb. Spicer). Not seen.

Hibbertia stricta R. Br.

forma *cinerea* Gandoger ibid. 304, '2°f. *cinerea*'.

TYPE: Tasmania, Goulds Country ('Foulds County'). Simson 338 ex parte (ex Herb. Spicer). Not seen.

forma *glabra* Gandoger ibid. 304, '1°f. *glabra*'.

TYPE: Tasmania, Goulds Country ('Foulds County'), Simson 338 ex parte (ex Herb. Spicer). Not seen.

forma *gunnii* Gandoger ibid. 305, '3°f. *Gunnii*'.

Type: Tasmania, Launceston Cataract, Gunn 22a (ex Herb. Spicer). Not seen.

forma *rosmarinifolia* Gandoger ibid. 305, '4°f. *rosmarinifolia*'.

Type: Tasmania, New Norfolk, Gunn 22b (ex Herb. Spicer). Not seen.

Isopogon confertus Gandoger in Bull. Soc. Bot. France LXVI (1919) 229.

— **I. anethifolius** (Salisb.) Knight.

Holotype: New South Wales, Never Never, Rylstone, Baker 10.1897 (ex Technological Museum, Sydney). The vegetative parts of NSW 17595 are a good match for the type.

Isopogon cornu–damae Gandoger ibid. 229.

— **I. ceratophyllus** R. Br.

Holotype: Victoria, 1902 (ex Herb. Walter). NSW 41465 is a good match for the type.

Isopogon eriocladus Gandoger ibid. 228.

— **I. sphaerocephalus** Lindl.

Holotype: Western Australia, Darling Range near Serpentine, Fitzgerald 9.1900 (ex Herb. Fitzgerald).

Isopogon eriophorus Gandoger ibid. 229.

— **I. anethifolius** (Salisb.) Knight.

Holotype: New South Wales, Berowra, Maiden 7.1899 (ex Herbarium, Botanic Gardens, Sydney).

Isopogon globosus Gandoger ibid. 229.

— **I. anethifolius** (Salisb.) Knight.

LECTOTYPE: New South Wales, Port Jackson, Walter 8.1897 (ex Herb. Walter). NSW 75801 is a good match for the lectotype (and is also a good match for the type of *I. virgatulus* Gandoger).

Syntype: New South Wales, Port Jackson, Tovey s.n., 1910 (ex National Herbarium of Victoria).

The syntype does not agree with Gandoger's description, but otherwise there is no apparent reason for doubting that it is a syntype.

Isopogon ovoideus Gandoger ibid. 228.

— **I. sphaerocephalus** Lindl.

Holotype: Western Australia, Smith's Mill, Darling Range, Morrison 1.1898 (ex Herb. Morrison).

The type sheet bears two specimens, one in flower (on the right), the other in fruit.

Isopogon scaberulus Gandoger ibid. 229.

— **I. ceratophyllus** R. Br.

Holotype: Victoria, Mentone, Tovey 10.1910 (ex National Herbarium of Victoria).

Isopogon virgatulus Gandoger ibid. 229.

— **I. anethifolius** (Salisb.) Knight.

Holotype: New South Wales ('Australia occid.'), 1902 (ex Herb. Walter). NSW 75801 is a good match for the type.

Isopogon anethifolius is endemic to N.S.W. A Western Australian species, *I. divergens*, is superficially similar.

Kennedia laevipes Gandoger in Bull. Soc. Bot. France LX (1913) 459, '*Kennedya*'.

— probably *K. prostrata* R.Br.

Syntypes: Victoria, Brisbane Ranges, St. John; Tasmania, Simson. Not seen.

Kunzea glabriuscula Gandoger in Bull. Soc. Bot. France LXV (1918) 26.

— **K. muelleri** Benth.

LECTOTYPE: Victoria, Mt. Hotham, Audas 6.1910 (ex National Herbarium of Victoria).

Syntypes: New South Wales, Thredbo River, Mount Kosciusko, Maiden & Forsyth ('Maiden') (ex Herbarium, Botanic Gardens, Sydney); in monte Kosciusko, Walter s.n., 1903 (in Herb. Gandoger).

Isosyntype: NSW 89804 (Maiden & Forsyth).

(B.G. Briggs)

Lambertia barbata Gandoger in Bull. Soc. Bot. France LXVI (1919) 228.

— **L. formosa** Sm.

LECTOTYPE: New South Wales, Walter 1.1904 (ex Herb. Walter). NSW 119052 is a good match for the lectotype.

Syntype: New South Wales, 1902 (ex Herb. Walter).

Lambertia proxima Gandoger ibid. 228.

— **L. formosa** Sm.

LECTOTYPE: New South Wales, Hornsby, Baker 3.1897 (ex Technological Museum, Sydney), specimen on the left of the sheet.

Syntypes: New South Wales, Hornsby, Baker 3.1897 (ex Technological Museum, Sydney) specimen on the right of the sheet bearing the Lectotype; Port Jackson District, Maiden s.n., 1895 (ex Herbarium, Botanic Gardens, Sydney).

The syntypes on the latter sheet (Port Jackson District) are two small specimens on the centre right; three other specimens on the same sheet have characteristics contrary to Gandoger's description and have not been regarded as syntypes; one other specimen is vegetative only and its status as a type is doubtful. The lectotype agrees with Gandoger's description of floral indumentum, and depicts the foliar characteristic "folia recta" more clearly than the fragmentary syntypes on the other sheet.

Leptospermum subargenteum Gandoger in Bull. Soc. Bot. France LXV (1918) 26.

— **L. lanigerum** (Ait.) Sm., originally determined as *L. pubescens* Lam.

Holotype: Victoria, near Harrietville, Audas 6.1910 (ex National Herbarium of Victoria).

(B.G. Briggs)

Leucopogon collinus R. Br.

forma *cinereus* Gandoger in Bull. Soc. Bot. France XLVII (1900) 307, '1°f. *cinerea*'.

Type: Tasmania, Huon Road, Spicer (ex Herb. Spicer). Not seen.

forma *spiciger* Gandoger ibid. 307, '2°f. *spicigera*'.

Type: Tasmania, Patriarchs, Flinders Island, Simson 571 (ex Herb. Spicer). Not seen.

forma *thymifolius* Gandoger ibid. 307, '3°f. *thymifolia*'.

Type: Tasmania, Birchs Inlet ('Julet'), Milligan 807 (ex Herb. Spicer). Not seen.

Leucopogon cygnorum Gandoger in Bull. Soc. Bot. France LXV (1918) 55.

— **L. parviflorus** (Andr.) Lindl., originally determined as *L. richei* R. Br.

Holotype: Western Australia, coast near mouth of Swan River, Morrison 8.1899 (ex Herb. Morrison).

Leucopogon glabratus Gandoger ibid. 55.

— **L. ? pulchellus** Sond.

Holotype: Western Australia, Perth, Moore 8.1899 (ex Herbarium, Botanic Gardens, Sydney).

Leucopogon milliganii Gandoger ibid. 55, '*Milligani*'.

— **L. ericoides** R. Br.

Holotype: Tasmania, Milligan 521, 1846 (ex Herb. Spicer).

Leucopogon morrisonii Gandoger ibid. 55.

— **L. ? pulchellus** Sond.

Holotype: Western Australia, Darling Range at Darlington, Morrison 6.1899 (ex Herb. Morrison).

Lomatia arguta Gandoger in Bull. Soc. Bot. France LXVI (1919) 228.

— **L. myricoides** (Gaertn. f.) Domin, originally determined as *L. longifolia* R. Br.

Holotype: New South Wales, Mt. Wilson, Gregson ('Gregson! Maiden!') 12.1898 (ex Herbarium, Botanic Gardens, Sydney). NSW 90889, dated "12.97" is probably an isotype.

Lomatia densa Gandoger ibid. 228.

— **L. myricoides** (Gaertn. f.) Domin, originally determined as *L. longifolia* R. Br.

Holotype: New South Wales, Delegate ('Delgate') Mountain, Bäuerlen ('Baker') (ex Technological Museum, Sydney). Not seen.

Lomatia fallacina Gandoger ibid. 228.

— **L. myricoides** (Gaertn. f.) Domin, originally determined as *L. longifolia* R. Br.

Holotype: Victoria, 1902 (ex Herb. Walter).

The characteristics of the material do not clearly indicate that it is of Victorian origin.

Lomatia praelonga Gandoger ibid. 228.

— **L. myricoides** (Gaertn. f.) Domin, originally determined as *L. longifolia* R. Br.

Holotype: Victoria, East Gippsland, Walter (ex Herb. Walter). Not seen.

Lomatia stenophylla Gandoger ibid. 228.

— **L. myricoides** (Gaertn. f.) Domin, originally determined as *L. longifolia* R. Br.

Holotype: Victoria, East Gippsland, Pescott ('Walter! Pescott!') (ex Herb. Walter). NSW 100685 is a good match for the type.

On the label Gandoger has added "f. angustifolia" to the name *L. longifolia.*

Luzula novae-cambriae Gandoger in Bull. Soc. Bot. France XLVI (1899) 392.

— *L. oldfieldii* var. *angustifolia* Nordenskiöld intergrading into *L. meridionalis* var. *flaccida* (Buchen.) Nordenskiöld, originally determined as *L. campestris* DC.

Holotype: New South Wales, Mount Kosciusko, Maiden & Forsyth 1.1899 (ex Herbarium, Botanic Gardens, Sydney).

Isotypes: NSW 657717 (a portion of this is at Christchurch, CHR 152622).

The name is discussed in the following references:— Gandoger (1902) 182; Maiden (1903) 173; Gandoger (1906) 532–534; Nordenskiöld (1969) 82.

(L.A.S. Johnson)

Melaleuca glaucocalyx Gandoger in Bull. Soc. Bot. France (1918) 26, '*Malaleuca*'.

— **M. bracteata** F. Muell., originally determined as *M. parviflora* Lindl.

HOLOTYPE: New South Wales, Murwillumbah, Forsyth 10.1898 (ex Herbarium, Botanic Gardens, Sydney).

ISOTYPE: NSW 89803.

The type was examined, and determined as *M. bracteata* by S.T. Blake in May 1956. See Blake (1968) 65.

Microseris latifolia Gandoger ibid. 52, '*Microderis*'.

— **M. scapigera** (Soland. ex A. Cunn.) Schultz-Bip., originally determined as *M. forsteri* Hook. f.

HOLOTYPE: New South Wales, Tia Falls, Forsyth & Cheel ('Forsyth') (ex National Herbarium of N.S.W.).

ISOTYPE: NSW 125037.

Microseris obtusifolia Gandoger ibid. 52, '*Microderis*'.

— **M. scapigera** (Soland. ex A. Cunn.) Schultz-Bip., originally determined as *M. forsteri* Hook. f.

HOLOTYPE: Tasmania, Little Plains, Simson 527, 2.1877 (ex Herb. Spicer).

Microseris tasmanica Gandoger ibid. 52, '*Microderis*'.

— **M. scapigera** (Soland. ex A. Cunn.) Schultz-Bip., originally determined as *M. forsteri* Hook. f.

HOLOTYPE: Tasmania, Kangaroo ('Kanguroo') Point, Spicer 11.1877 (ex Herb. Spicer).

Microseris tenuicula Gandoger ibid. 52, '*Microderis*'.

— **M. scapigera** (Soland. ex A. Cunn.) Schultz-Bip., originally determined as *M. forsteri* Hook. f.

HOLOTYPE: Tasmania, Sandy Bay, Spicer 1.1877 (ex Herb. Spicer).

The "n. 94", cited by Gandoger, is a herbarium reference and not a collection number.

Microseris walteri Gandoger ibid. 52, '*Microderis*'.

— **M. scapigera** (Soland. ex A. Cunn.) Schultz-Bip., originally determined as *M. forsteri* Hook. f.

HOLOTYPE: Victoria, Sandringham, Walter 9.1900 (ex Herb. Walter).

Millotia hispidula Gandoger ibid. 45.

— **M. tenuifolia** Cass. var. **tenuifolia.**

LECTOTYPE: Western Australia, Kelmscott, Canning River, Morrison 9.1898 (ex Herb. Morrison), specimen at top right of the sheet.

One plant, plus a separate flowering head of *Millotia myosotidifolia* (Benth.) Steetz are also on the type sheet. The determinations and selection of a lectotype were made by R. Schodde in May, 1958; see Schodde (1963) 231, 233. The selection of a lectotype for the name *M. hispidula* has not been mentioned previously in publication.

Monotoca concolor Gandoger ibid. 55.

— **Leucopogon gelidus** (Benth.) Wakefield, originally misdetermined as *Monotoca elliptica* R. Br. (This is another instance of Gandoger being misled by a wrong determination, see also *Carex maidenii*).

HOLOTYPE: Victoria, Mt. Hotham ('m. Hothan'), Audas 6.1910 (ex National Herbarium of Victoria).

The name *Styphelia gelida* (Benth.) J.H. Willis is also applied to this taxon; see Willis (1967) 140.

Olearia ramulosa (Labill.) Benth.

forma *arborescens* Gandoger in Bull. Soc. Bot. France XLVII (1900) 307.

Syntypes: Tasmania, New Town and Kanguroo Bottom, Spicer (ex Herb. Spicer). Not seen.

forma *deflexifolia* Gandoger ibid. 307.

Type: Tasmania, Port Arthur, Coverdale (ex Herb. Spicer). Not seen.

forma *imbricata* Gandoger ibid. 306.

Type: Tasmania, New Town, Spicer (ex Herb. Spicer). Not seen.

forma *obovata* Gandoger ibid. 307.

Type: Tasmania, Peppermint Bay, Simson (ex Herb. Spicer). Not seen.

forma *rosmarinoides* Gandoger ibid. 306.

Type: Tasmania, New Town, Spicer (ex Herb. Spicer). Not seen.

forma *simsonii* Gandoger ibid. 307, '*Simsoni*'.

Type: Tasmania, Falmouth, Simson 102 (ex Herb. Spicer). Not seen.

forma *spiceri* Gandoger ibid. 306.

Type: Tasmania, New Town, Spicer (ex Herb. Spicer). Not seen.

forma *tasmanica* Gandoger ibid. 306.

Type: Tasmania, Pirates Bay, Spicer (ex Herb. Spicer). Not seen.

Persoonia adjacens Gandoger in Bull. Soc. Bot. France LXVI (1919) 227.

— **P. juniperina** Labill.

Holotype: Victoria, near Harrietville, Audas 6.1910 (ex National Herbarium of Victoria).

(L.A.S. Johnson and D.J. McGillivray)

Persoonia breviuscula Gandoger ibid. 227.

— **P. linearis** Andr.

Holotype: Queensland [sphalm.], 1902 (ex Herb. Walter), specimen on the right of the sheet.

The other specimen is also *P. linearis* (NSW 21592 is a duplicate) but not associated with the typification of this name, as it has leaves 4–5 cm long. This species does not occur in Queensland.

(L.A.S. Johnson and D.J. McGillivray)

Persoonia effusa Gandoger ibid. 228.

— **P. chamaepeuce** Lhotsky ex Meisn.

Holotype: New South Wales, Sunny Corner, Maiden 11.1899 (ex Herbarium, Botanic Gardens, Sydney).

Isotype: NSW 21045 (collector: Boorman).

(L.A.S. Johnson and D.J. McGillivray)

Persoonia latiuscula Gandoger ibid. 227.

— **P. juniperina** Labill.

Holotype: Victoria, 1902 (ex Herb. Walter), specimen on the left of the sheet.

The specimen at the top right of the sheet has leaves less than 2 mm wide and conspicuously narrower than those of the type.

(L.A.S. Johnson and D.J. McGillivray)

Persoonia maidenii Gandoger ibid. 227.

— **P. laurina** Pers., originally determined as *P. ferruginea* Sm.

HOLOTYPE: New South Wales, Port Jackson District, Maiden 1.1893 (ex Herbarium, Botanic Gardens, Sydney).

There is no Isotype at the National Herbarium of N.S.W., and it seems unlikely that Maiden was the collector.

(L.A.S. Johnson and D.J. McGillivray)

Persoonia monticola Gandoger ibid. 227.

— **P. laurina** Pers., originally determined as *P. ferruginea* Sm.

HOLOTYPE: New South Wales, Mount Victoria, Walter 12.1886 (ex Herb. Walter).

(L.A.S. Johnson and D.J. McGillivray)

Persoonia myrioclada Gandoger ibid. 228.

— **P. chamaepeuce** Lhotsky ex Meisn.

HOLOTYPE: New South Wales, Monga, Bäuerlen ('Baker') 12.1898 (ex Technological Museum, Sydney).

(L.A.S. Johnson and D.J. McGillivray)

Persoonia patulifolia Gandoger ibid. 227.

— **P. pinifolia** R. Br.

HOLOTYPE: New South Wales, Port Jackson District, Walter 9.1900 (ex Herb. Walter).

(L.A.S. Johnson and D.J. McGillivray)

Persoonia pervagans Gandoger ibid. 227.

— **P. pinifolia** R. Br.

LECTOTYPE: New South Wales, Blue Mountains, Camfield ('Camfield! Maiden!') 12.1899 (ex Herbarium, Botanic Gardens, Sydney), specimen on the right of the sheet. The other specimen may be part of a syntype.

ISOLECTOTYPE: NSW 20920.

SYNTYPES: New South Wales, Blue Mountains, Walter 12.1899 (ex Herb. Walter); New South Wales, 1902 (ex Herb. Walter).

(L.A.S. Johnson and D.J. McGillivray)

Persoonia phyllostachys Gandoger ibid. 227.

— **P. linearis** Andr.

HOLOTYPE: New South Wales, Mt. Wilson, Gregson ('Gregson! Maiden!') 12.1898 (ex Herbarium, Botanic Gardens, Sydney).

(L.A.S. Johnson and D.J. McGillivray)

Persoonia porrigens Gandoger ibid. 227.

— **P. juniperina** Labill.

HOLOTYPE: Victoria, Oakleigh ('Oukleigh') District, Walter 12.1897 (ex Herb. Walter), specimen on the right of the sheet.

A specimen (NSW 21095) from Glenelg River, collected by Walter 7.1892 appears to be an isotype. The other specimen on the type sheet may be associated with the label but it is not part of the type.

(L.A.S. Johnson and D.J. McGillivray)

Persoonia recedens Gandoger ibid. 227.

— **P. nutans** R. Br. sens. lat., originally misdetermined as *P. chamaepeuce* Lhotsky ex Meisn.; this belongs to the race formerly known as *P. oxycoccoides* Sieber ex Spreng.

Holotype: New South Wales, Blackheath, Walter 12.1882 (ex Herb. Walter). NSW 20904 is a good match for the type.

(L.A.S. Johnson and D.J. McGillivray)

Persoonia tasmanica Gandoger ibid. 227.

— **P. juniperina** Labill.

Holotype: Tasmania, Goulds Country ('Gould's C.'), Simson 330, 10.1875 (ex Herb. Spicer).

Gandoger describes the pedicels as glabrous — "pedunculi glabri", though they have a distinct sparse indumentum.

(L.A.S. Johnson and D.J. McGillivray)

Persoonia viridula Gandoger ibid. 228.

— **P. chamaepeuce** Lhotsky ex Meisn.

LECTOTYPE: Victoria, 1902 (ex Herb. Walter), specimen on the right of the sheet. The other specimen may be part of the syntype.

Syntype: Victoria, near Harrietville, Audas 6.1910 (ex National Herbarium of Victoria).

Gandoger describes *P. viridula* as having leaves 2 cm long, thus distinguishing it from two other species having leaves of 1 cm. The lectotype has leaves 2·5–3·0 cm long, while in the syntype they are 1·5–2·0 cm long.

(L.A.S. Johnson and D.J. McGillivray)

Persoonia walteri Gandoger ibid. 227.

— **P. linearis** Andr.

Holotype: New South Wales, Mt. Victoria, Walter 2.1901 (ex Herb. Walter).

(L.A.S. Johnson and D.J. McGillivray)

Petrophile argyrotricha Gandoger ibid. 226, '*Petrophila*'.

— **P. biloba** R. Br.

Holotype: Western Australia, Greenmount, Darling Range, Morrison 8.1897 (ex Herb. Morrison).

A specimen collected by Helms (NSW 75981) is possibly an isotype.

Petrophile bakerana Gandoger ibid. 226, '*Petrophila Bakersana*'.

— **P. pedunculata** R. Br.

Holotype: New South Wales, Picton, Baker 11.1896 (ex Technological Museum, Sydney).

Petrophile chrysotricha Gandoger ibid. 226, '*Petrophila*'.

— **P. (?) biloba** R. Br., approaching *P. propinqua* R. Br.

Holotype: Western Australia, Drummond s.n., 1880 (ex National Herbarium of Victoria).

The flowers of this specimen show a greater resemblance to those of *P. propinqua* than is usual.

Petrophile dasyclada Gandoger ibid. 226, '*Petrophila*'.

— **P. striata** R. Br.

Holotype: Western Australia, Woorooloo, Koch 9.1907 (ex National Herbarium of Victoria).

✓ *Petrophile obtusifida* Gandoger ibid. 226, '*Petrophila*'.

— **P. pedunculata** R. Br.

LECTOTYPE: New South Wales, Wingello, Walter 12.1899 (ex Herb. Walter). This specimen satisfies the details of Gandoger's description more completely and more definitely than does the other syntype which is without an infructescence.

SYNTYPE: New South Wales, Wingello, Boorman ('Boorman! Maiden!') 12.1899 (ex Herbarium, Botanic Gardens, Sydney).

The Lectotype is a duplicate of the Boorman collection sent on exchange to Walter from the Botanic Gardens, Sydney. [An unusual example of typal nomenclature].

✓ *Petrophile stylaris* Gandoger ibid. 226, '*Petrophila*'.

— **P. striata** R. Br.

HOLOTYPE: Western Australia, Kelmscott, Canning River, Morrison 9.1898 (ex Herb. Morrison), specimen on the right of the sheet; NSW 76006 is a good match for the type.

The other specimen with a label from the Herbarium of the Department of Agriculture, W.A., was collected at the same locality and in the same month by R. Helms. The correct assignment of the labels to the specimens was possible by comparison of the type sheet with the duplicate of this Helms collection at the National Herbarium of N.S.W. (NSW 76006). The glabrous tips of the tepals have been described by Gandoger as "styli exserti".

Pimelea crassifolia Gandoger in Bull. Soc. Bot. France LX (1913) 418.

— probably *P. axiflora* var. *alpina* F. Muell. ex Benth., originally determined as *P. axiflora* F. Muell. (incorrectly cited by Gandoger as *P. axilliflora*).

SYNTYPES: New South Wales, Mount Kosciusko, alt. 6–7000 ft, Maiden; Victoria, in alpibus, Walter. Not seen.

Pimelea esulifolia Gandoger ibid. 419.

— originally determined as *P. humilis* R. Br.

TYPE: Victoria, in alpibus Victoriae, Walter. Not seen.

Pimelea strigosa Gandoger ibid. 419.

— originally determined as *P. curviflora* var. *pedunculata* Benth.

TYPE: New South Wales, Warrumbungle Ranges, Forsyth & Maiden. Not seen.

ISOTYPE (?): NSW 120783 (collector: Forsyth).

Pimelea tasmanica Gandoger ibid. 419.

— originally determined as *P. humilis* R. Br.

TYPE: Tasmania; Mt. Tor, Spicer 147 (ex Herb. Spicer). Not seen.

Pimelea walteri Gandoger ibid. 418.

— originally determined as *P. axiflora* F. Muell. (incorrectly cited by Gandoger as *P. axilliflora*).

TYPE: Victoria, in alpibus Victoriae, Walter. Not seen.

Podolepis laevigata Gandoger in Bull. Soc. Bot. France LXV (1918) 46.

— **P. jaceoides** (Sims) Voss, originally determined as *P. acuminata* R. Br.

LECTOTYPE: Victoria, Wimmera, Reader 10.1892 (source of material not indicated, possibly ex National Herbarium of Victoria.)

SYNTYPES: Victoria, Keilor Plains, Walter 9.1900 (ex Herb. Walter); Victoria, Mentone, Tovey 10.1907 (ex National Herbarium of Victoria).

Podolepis papillosa Gandoger ibid. 46.

— **P. jaceoides** (Sims) Voss, originally determined as *P. acuminata* R. Br.

LECTOTYPE: New South Wales, Warrumbungle Ranges, Forsyth 10.1899 (ex Herbarium, Botanic Gardens, Sydney).

ISOLECTOTYPE: NSW 25486.

SYNTYPE: Victoria, Walter s.n. Not seen.

The label for the lectotype is annotated by Gandoger with the specific name.

(N.C. Ford)

Potamogeton odontocarpus Gandoger in Bull. Soc. Bot. France XLVI (1899) 393.

— **P. tricarinatus** F. Muell. et A. Benn, originally determined as *P. natans* L.

HOLOTYPE: New South Wales, Walcha district, Betche ('Betche! Maiden!') 12.1898 (ex Herbarium, Botanic Gardens, Sydney).

For discussion on the application of this name see Gandoger (1902) 183, Maiden (1903) 173–174 and Gandoger (1906) 533.

(B.G. Briggs)

Prostanthera eriocalyx Gandoger in Bull. Soc. Bot. France LXV (1918) 67.

— **P. ? aspalathoides** A. Cunn. ex Benth., originally determined as *P. coccinea* F. Muell.

HOLOTYPE: Victoria, N. West Victoria, Walter 10.1892 (ex Herb. Walter).

Prostanthera patula Gandoger ibid. 67.

— **P. ? aspalathoides** A. Cunn. ex Benth., originally determined as *P. coccinea* F. Muell.

HOLOTYPE: Victoria, Wimmera, Sutton 10.1905 (ex National Herbarium of Victoria).

Psilotum flabellatum Gandoger in Bull. Soc. Bot. France LXVI (1919) 306.

— **P. nudum** (L.) Griseb.

HOLOTYPE: New South Wales, Berowra, Boorman 10.1902 (ex National Herbarium of N.S.W.). NSW P3491 is a good match for the type.

(M.D. Tindale)

Pteris esculenta Forst. f.

The name *Pteris esculenta* is the basionym for the correct name *Pteridium esculentum* (Forst. f.) Cockayne. However the identity of the types of Gandoger's names could be determined only after examination of the specimens. Gandoger's epithets would have to be considered, if the category of *forma* is introduced into the taronomy of *Pteridium esculentum* in Australia.

(M.D. Tindale)

Pteris esculenta

forma *australiensis* Gandoger in Bull. Soc. Bot. France XLVII (1900) 308, '3°f. *australiensis*'.

TYPE: South Australia, Wilson s.n. Not seen.

forma *coriacea* Gandoger ibid. 308, '2°f. *coriacea*'.

SYNTYPES: Tasmania, Kanguroo Bottom, Spicer; Tasmania, Port Arthur, Coverdale s.n. (both ex Herb. Spicer). Not seen.

forma *elongella* Gandoger ibid. 308, '1°f. *elongella*'.

SYNTYPES: Tasmania, Winton et Sandy Bay, Spicer; South Australia, Burrons [?] s.n.; South Australia, Koch s.n.; South Australia, Menzel s.n. Not seen.

Ptilotus oblongifolius Gandoger in Bull. Soc. Bot. France LXVI (1919) 222.

— **P. obovatus** (Gaudich.) F. Muell.

HOLOTYPE: New South Wales, Bourke district, Maiden 5.1900 (ex Herbarium, Botanic Gardens, Sydney).

Pultenaea tasmanica Gandoger in Bull. Soc. Bot. France LX (1913) 461.

— possibly *P. gunnii* var. *baeckeoides* Rodway; originally determined as *P. gunnii* Benth.

TYPE: Tasmania, Huon Road, Spicer (ex Herb. Spicer). Not seen.

Rhagodia cygnorum Gandoger in Bull. Soc. Bot. France LXVI (1919) 224.

— **R. radiata** Nees, originally determined as *R. billardieri* R. Br.

HOLOTYPE: Western Australia, Fremantle, mouth of Swan R., Morrison 3.1899 (ex Herb. Morrison).

(J.C. De Nardi)

Ricinocarpos megalanthus Gandoger ibid. 287, '*Ricinocarpus*'.

— **R. pinifolius** Desf.

HOLOTYPE: New South Wales, Port Jackson District, Maiden 9.1898 (ex Herbarium, Botanic Gardens, Sydney).

The original collection from which this material was taken is probably NSW 90446, Nepean River, Forsyth 9.1898.

Ricinocarpos proximus Gandoger ibid. 287, '*Ricinocarpus*'.

— **R. pinifolius** Desf.

HOLOTYPE: Victoria, Walter 11.1898 (ex Herb. Walter), specimen on the right of the sheet. NSW 119054 is a good match for the type. The other specimen on the sheet is not of the type collection.

Rubus

Although Gandoger has placed these names in the infraspecific category of *species secundi ordinis*, they are here treated as names of species.

Rubus boormanii Gandoger in Bull. Soc. Bot. France LXV (1918) 25, '*Boormani*'.

— **R. parvifolius** L.

HOLOTYPE: New South Wales, Awaba, Boorman 10.1899 (ex Herbarium, Botanic Gardens, Sydney).

ISOTYPE: NSW 119048.

(A.N. Rodd)

Rubus × *novae-cambriae* Gandoger ibid. 25, '*Novae Cambriae*', pro species.

— **R. hillii** F. Muell. × **R. parvifolius** L.

HOLOTYPE: New South Wales, Menangle, Baker 10.1893 (ex Technological Museum, Sydney).

(A.N. Rodd)

Rubus simsonianus Gandoger ibid. 25.

— **R. parvifolius** L.

HOLOTYPE: Tasmania, Simson s.n., 1875. NSW 119049 is a good match for the type.

This specimen was removed from the sheet now bearing the type of *R. tasmanicus* Gandoger.

(A.N. Rodd)

Rubus tasmanicus Gandoger ibid. 25.

— **R. parvifolius** L.

HOLOTYPE: Tasmania, Simson s.n., 1875.

The right hand portion of the sheet is stained in a manner indicating the former presence of the type of *R. simsonianus*.

(A.N. Rodd)

Rubus walteranus Gandoger ibid. 25, '*Walterianus*'.

— **R. parvifolius** L.

HOLOTYPE: Victoria ('N.S.Wales'), Wandong Ranges, Walter 10.1898 (ex Herb. Walter). NSW 119047 is a good match for the type.

(A.N. Rodd)

Santalum densiflorum Gandoger in Bull. Soc. Bot. France LXVI (1919) 232.

— **S. acuminatum** (R. Br.) DC.

HOLOTYPE: South Australia, Mt. Lyndhurst, Koch 47, 11.1899 (ex Herbarium, Botanic Gardens, Sydney).

(D.F. Blaxell)

Santalum leptocladum Gandoger ibid. 232.

— **S. lanceolatum** R. Br.

HOLOTYPE: South Australia, Mt. Lyndhurst, Koch 27, 5.1900. NSW 68228, from the same locality, is a good match for the type.

(D.F. Blaxell)

Santalum megacarpum Gandoger ibid. 232.

— **S. lanceolatum** R. Br.

HOLOTYPE: New South Wales, Cobar, Boorman ('Maiden') 7.1903 (ex National Herbarium of N.S.W.).
ISOTYPE: NSW 68213.

(D.F. Blaxell)

Spergularia media Presl ex Griseb.

forma *diemenica* Gandoger in Bull. Soc. Bot. France XLVII (1900) 306.

SYNTYPES: Tasmania, Kanguroo Point, Spicer; Tasmania, Circular Head, Gunn 654 (both ex Herb. Spicer). Not seen.

Stypandra graminea Gandoger in Bull. Soc. Bot. France LXVI (1919) 292.

— **S. glauca** R. Br. sens. lat.

HOLOTYPE: Western Australia, Moore 10.1899 (ex Herbarium, Botanic Gardens, Sydney).

(A.N. Rodd)

Stypandra juncinella Gandoger ibid. 293.

— **S. caespitosa** R. Br., originally determined as *S. caespitosa* var. *umbellata*.

HOLOTYPE: New South Wales, Barbers Creek, Rumsey ('Maiden') 10.1898 (ex Herbarium, Botanic Gardens, Sydney).
ISOTYPE: NSW 121150.

(A.N. Rodd)

Stypandra laeta Gandoger ibid. 292.

— **S. glauca** R. Br.

HOLOTYPE: Western Australia, Kelmscott, Canning River, Morrison 9.1898 (ex Herb. Morrison).

(A.N. Rodd)

Stypandra latifolia Gandoger ibid. 292.

— **S. glauca** R. Br.

HOLOTYPE: New South Wales, Scone ('Sonne'), Maiden 8.1899 (ex Herbarium Botanic Gardens, Sydney).
ISOTYPE: NSW 120958.

A.N. Rodd)

Triglochin pycnostachys Gandoger ibid. 294.

— **T. striata** Ruiz et Pavon.

HOLOTYPE: New South Wales, Byron Bay, Forsyth 11.1898 (ex Herbarium, Botanic Gardens, Sydney).

(B.G. Briggs)

Trisetum maidenii (Gandoger) Gandoger in Bull. Soc. Bot. France XLI (1902) 182.

— **T. spicatum** (L.) Richt.

HOLOTYPE: as for *T. subspicatum* forma *maidenii*. See Gandoger (1906) 532.

Trisetum subspicatum

forma *maidenii* Gandoger in Bull. Soc. Bot. France XLVI (1899) 393, basionym for *T. maidenii*.

— **T. spicatum** (L.) Richt.

HOLOTYPE: New South Wales, Mount Kosciusko, Maiden and Forsyth ('Maiden') 1.1899 (ex Herbarium, Botanic Gardens, Sydney). Not seen.

At the National Herbarium of N.S.W. there are several specimens with the same collection data but which of them are isotypes is not known. For discussion on *Trisetum spicatum* see Morrison (1959). The name *T. spicatum* var. *maidenii* (Gandoger) Fernald has also been applied to this taxon.

Tristania bakerana Gandoger in Bull. Soc. Bot. France LXV (1918) 27, '*Bakeriana*'.

— **T. laurina** (Sm.) R. Br.

HOLOTYPE: New South Wales, Baker s.n., 1898 (ex Technological Museum, Sydney).

(B.G. Briggs)

Veronica maideniana Gandoger in Bull. Soc. Bot. France LXVI (1919) 220.

— **Parahebe derwentiana** (Andr.) Briggs et Ehrendorfer, originally determined as *Veronica derwentiana* Andr., '*Derwentia*'.

HOLOTYPE: New South Wales, Mt. Kosciusko, Maiden (ex Herbarium, Botanic Gardens, Sydney). Not seen.
ISOTYPE: NSW 6201.

Westringia lurida Gandoger in Bull. Soc. Bot. France LXV (1918) 68.

— **W. rigida** R. Br.

HOLOTYPE: Victoria, North West Mallee ('Malec'), Hardy 10.1910 (ex National Herbarium of Victoria).

Xanthosia tasmanica Gandoger ibid. 32.

— **X. pilosa** Rudge sens. lat. "Tasmanian race".

HOLOTYPE: Tasmania, Rocky Cape, Milligan 172, 10.1841 (ex Herb. Spicer). *Xanthosia pilosa* Rudge is in need of critical investigation. It comprises a number of geographic and morphological races, of which one of the more distinctive is the so-called "Tasmanian race" which, however, also occurs in a limited area near Cape Howe on the border of New South Wales and Victoria.

(L.A.S. Johnson)

Xerotes apiculata Gandoger in Bull. Soc. Bot. France LXVI (1919) 295.

— **Lomandra leucocephala** ssp. **robusta** Lee, originally determined as *Xerotes leucocephala* R. Br.

HOLOTYPE: Victoria, Wimmera, Walter 10.1900 (ex Herb. Walter).

The type is specimen 'A' on the left of the sheet labelled 2496a. The label for the type is on sheet No. 2496b. For discussion on the typification of this name, and of *X. fibrillosa*, see Lee (1966) 42.

(A.T. Lee)

Xerotes fibrillosa Gandoger ibid. 295, '*fribrillosa*'.

— **Lomandra leucocephala** R. Br. ssp. **leucocephala,** originally determined as *Xerotes leucocephala* R. Br.

LECTOTYPE: New South Wales, Dubbo, Boorman 8.1903 (ex National Herbarium of N.S.W.) The type is specimen 'B' on the right of the sheet labelled 2496a.

ISOLECTOTYPE: NSW 16244.

SYNTYPE: New South Wales, Dubbo, Boorman 8.1903 on sheet 2496b.

The label for the syntype is on sheet No. 2496a. For a full discussion on the typification of Gandoger's two names in *Xerotes* see Lee (1966) 42.

(A.T. Lee)

Zoysia iodostachys Gandoger ibid. 303.

— **Z. macrantha** Desv., originally determined as *Z. pungens* Willd.

HOLOTYPE: New South Wales, Port Jackson District, Maiden 7.1897 (ex Herbarium, Botanic Gardens, Sydney). NSW 25101 is a good match for the type. See Hubbard (1935b) 1.

(J.W. Vickery)

CONCLUDING REMARKS

Gandoger published 212 names for Australian plants; two of these are currently regarded as correct.

In the Bulletin de la Société Botanique de France, Gandoger published names of plants from:—

Abyssinia, Afghanistan, Africa, Algeria, Amboina, Anatolia, the Antilles, Arabia, Argentina, Armenia, Australia, the Azores, Bolivia, Borneo, Brazil, Burma, Canada, Canary Islands, Celebes, Chile, China, Cuba, Ecuador, Falkland Islands, Greece, Greenland, Guatemala, Guyana, Hawaii, India, Jamaica, Japan, Java, Kamchatka, Laos, Lapland, Lebanon, Madagascar, Madeira, Mexico, Morocco, New Caledonia, New Zealand, Patagonia, Persia, the Philippines, Samoa, Siberia, Spain, Sumatra, Syria, Timor, Turcomania, Turkestan, United States of America and Uruguay.

These names are of value to the tiro-taxonomist who may apply the same critical attention to them as he might to those in more important works. Although his errors, through lack of effort, judgement or knowledge, would not have any serious effects on existing nomenclature, he would be wise to seek assistance from experienced taxonomists, whenever he is in doubt.

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Wilson, P.G., 1970. — A taxonomic revision of the genera *Crowea*, *Eriostemon* and *Phebalium*. Nuytsia I (1), 1–155.

APPENDIX

INSTITUTIONS AND COLLECTORS ASSOCIATED WITH GANDOGER'S TYPES OF AUSTRALIAN PLANTS

INSTITUTIONS

BOTANIC GARDENS, SYDNEY

Gandoger received more than 1600 specimens from Sydney, all of them during the directorship of J.H. Maiden (q.v.). There are two kinds of institutional labels on the types examined: the earlier kind headed "Herbarium, Botanic Gardens, Sydney", and the other headed "NATIONAL HERBARIUM OF NEW SOUTH WALES" (see plates XXX, XXXI). Several specimens not bearing such labels were also sent from Sydney but there is no definite indication of this on the sheet, e.g. the type of *Grevillea glaucina* Gandoger.

For some names based on material sent from Sydney there are no isotypes in this herbarium, e.g. *Persoonia phyllostachys* Gandoger.

This institution is now known as the National Herbarium of New South Wales, Royal Botanic Gardens, Sydney.

DEPARTMENT OF AGRICULTURE, WESTERN AUSTRALIA

Specimens sent to Gandoger from this organization were collected during the period that Alexander Morrison (q.v.) was Botanist to the Department. In 1933 the collections from the Department of Agriculture and the Forests Department were amalgamated to form the basis for the herbarium which is now the Western Australian Herbarium, Jarrah Road, South Perth.

NATIONAL HERBARIUM OF VICTORIA

Gandoger received at least 100 specimens from this institution, 50 were sent in May 1909 and another 50 in July 1911; data from J.H. Willis (1960). Mr Willis also stated . . . "that no duplicates of any of the C. Walter collections donated to Gandoger were retained here [Melbourne]". It is possible that Gandoger received specimens directly from Charles Walter (q.v.) but no attempt has been made to verify this.

Most of the labels are headed "National Herbarium of Victoria", (see plate XXIX) but some bear the older blue label of the Phytologic Museum of Melbourne.

The address of this institution is the National Herbarium of Victoria, Royal Botanic Gardens, South Yarra.

TECHNOLOGICAL MUSEUM, SYDNEY

Specimens collected by R.T. Baker (q.v.) curator, and W. Bäuerlen (q.v.) collector, were received by Gandoger. This institution is now the Museum of Applied Arts and Sciences, Harris Street, Ultimo, Sydney.

COLLECTORS

NOTE: References to biographical data about a number of the following personalities may be found in J.H. Barnhart, *Biographical notes upon botanists.* Boston, 1965, 3 vols, and in Britten, J. and G.S. Boulger, *A biographical index of deceased British and Irish botanists.* Second edition, revised and completed by A.B. Rendle. London, 1931. Data on the present location of some of the collections is contained in Lanjouw, J. and F.A. Stafleu, *Index herbariorum* Part II, Collectors, Part II (1) A–D, 1954; Part II (2) E–H, 1957; Part II (3) I–L, 1972).

Audas, James Wales Clarendon 1872–1959

Botanical Assistant, and later Senior Botanist in the National Herbarium of Victoria. See Willis in Vict. Nat. LXXVII (1961) 273–275.

Baker, Richard Thomas 1854–1941

Economic Botanist and Curator, Technological Museum, Sydney. Baker's collections are also represented in the National Herbarium of New South Wales. Gandoger attributed to Baker some of the collections made by W. Bäuerlen (q.v.), the Museum's collector.

Names published by Gandoger commemorating Baker:—

Petrophile bakerana, a synonym of *P. pedunculata* R. Br.

Tristania bakerana, a synonym of *T. laurina* (Sm.) R. Br.

Bäuerlen, Wilhelm 1845–?

Collector for the Technological Museum, Sydney. On the labels, Bäuerlen's name is abbreviated to the initials "W.B.", and Gandoger has attributed these collections to R.T. Baker, whose name is printed at the base of the Technological Museum's label. Bäuerlen's collections are also represented in the National Herbaria of Victoria and New South Wales.

Betche, Ernst 1851–1913

Botanical Assistant, Botanic Gardens, Sydney. His original collections of Australian plants are housed in the National Herbarium of New South Wales (see plate XXXI). For biographical data see Maiden in Proc. Roy. Soc. N.S.W. LV (1921) 153, plate 9.

Name published by Gandoger commemorating Betche:—

Hakea betchei, a synonym of *H. eriantha* R. Br.

Boorman, John Luke 1864–1938

Botanical Collector, Botanic Gardens, Sydney. For biographical data see Vickery in J. Kew Guild VIII (1967) 817–819.

Name published by Gandoger commemorating Boorman:—

Rubus boormanii, a synonym of *R. parvifolius* L.

Burrons [? Burrows]

No biographical data is readily available. Burrons collected a syntype of *Pteris esculenta* forma *elongella* Gandoger in South Australia before 1900.

Camfield, Julius Henry 1852–1916

Overseer, Botanic Gardens, Sydney. A brief biography by Maiden appears in Rep. Director Bot. Gard. Sydney for 1916 (1918). His collections are housed in the National Herbarium of New South Wales.

Cheel, Edwin 1872–1951

Botanical Assistant, and later Curator, National Herbarium of New South Wales. See obituary notice in Proc. Roy. Soc. N.S.W. LXXXVI (1953) XIV.

Coghill

Probably George Coghill of Melbourne, at one time Treasurer of the Field Naturalists Club of Victoria. He was the collector of the type of *Atherosperma dilatatum* Gandoger, at Launching Place, Victoria.

Coverdale

Probably Coverdale, John 1814–1896, medical practitioner in Tasmania from 1837; for biographical data see Pike, D. [ed.], Australian Dictionary of Biography I (1966) 253–254. He collected the type of *Olearia ramulosa* forma *deflexifolia* Gandoger at Port Arthur, Tasmania.

Drummond, James 1784–1863

One of Australia's most noted botanical collectors whose collections are the foundation of the study of the Western Australian flora. For a detailed biography see Erickson, *The Drummonds of Hawthornden*. 1969, Osborne Park. In Australia the National Herbarium of Victoria has the most representative selection of Drummond's collections.

Forsyth, William 1864–1910

Overseer, Centennial Park, Sydney (a domain administered by the Director of the Botanic Gardens, Sydney). See Hedley in Proc. Linn. Soc. N.S.W. XXXVI (1911) 10–11.

Gandoger, Michel

Born Arnas, Rhône on 10 May, 1850; died Lyon on 4 October, 1926. For a biography and partial bibliography see Charbonnel in Bull. Soc. Bot. France LXXIV (1927) 3–11.

Goadby, Bede Theodoric

Collector in Western Australia. His personal herbarium is in the Western Australian Herbarium. Some of his specimens are contained in the herbaria at Kew, Melbourne and Sydney. For a short biography see Coleman in Vict. Nat. XLII (1945) 30.

Gregson, Jesse

His collections were sent to J.H. Maiden (q.v.) many of them from Mount Wilson in New South Wales. They are now in the National Herbarium of New South Wales.

Gunn, Ronald Campbell 1808–1881

The most noted of Tasmanian botanical collectors. His collections are in many herbaria, and are particularly well-represented at Kew. The National Herbarium of New South Wales also has a number of his specimens. For references to biographical data see Barnhart, and Britten and Boulger.

Name published by Gandoger commemorating Gunn:—

Hibbertia stricta forma *gunnii.*

Hardy, Alfred Douglas

Collector of the holotype of *Westringia lurida* Gandoger, in the North West Mallee, Victoria, October, 1910. Member of the Field Naturalists Club of Victoria.

Helms, Richard 1842–1914

Naturalist and collector. See Hedley in Proc. Roy. Soc. N.S.W. XLIX (1915) 11–14.

Heron, W.

Heron sent specimens to J.H. Maiden from Conjola, New South Wales; his collections are in the National Herbarium of New South Wales.

Koch, Max 1854–1925 (q.v. p. 322)

Boundary rider and sawmill hand, collector of seeds and specimens for sale and for donation. Koch frequently applied the same collection number to different gatherings of the same species. For biographical notes see Audas in Journ. Roy. Soc. W. Austral. XV (1929) 83–86. Gandoger is not mentioned in Audas' account of persons and institutions in receipt of specimens from Koch, although the latter sent 400 sheets directly to Gandoger (see plate XXVIII). (The holotype of *Santalum densiflorum* Gandoger, collected by Koch, was sent to Gandoger from the Botanic Gardens, Sydney.)

Lea, Arthur Mills 1868–1932

Entomologist. For biography see Wilson in Vict. Nat. XLIX (1932) 15–18.

Lucas, Arthur Henry Shakespeare 1853–1936

Teacher and botanist. For biography see [Carter] in Proc. Linn. Soc. N.S.W. LXII (1937) 243–249, t. xii.

Maclean

Collector of a syntype of *Comesperma ericinum* forma *aristulosum* Gandoger, in Victoria before 1913.

McLennan, John P. ('MacLennan') died 1921.

Teacher, and keen student of the Victorian flora. For brief biographical notes see Vict. Nat. XXXVIII (1921) 36.

Maiden, Joseph Henry 1859–1926

Director, Botanic Gardens, Sydney 1896–1924, and founder of the National Herbarium of New South Wales. For biography and partial bibliography see [Lucas] in Proc. Linn. Soc. N.S.W. LV (1930) 355–370, plate.

Names published by Gandoger commemorating Maiden:—

Carex maidenii, a synonym of *Carex gaudichaudiana* Kunth.

Epacris maidenii, a synonym of *Epacris microphylla* R. Br.

Euphrasia maidenii, a synonym of *Euphrasia glacialis* Wettst. var. *glacialis*, see plate XXX.

Helichrysum semipapposum forma *maidenii.*

Persoonia maidenii, a synonym of *Persoonia laurina* Pers.

Trisetum subspicatum forma *maidenii* and *Trisetum maidenii* (Gandoger) Gandoger, synonyms of *Trisetum spicatum* (L.) Richt.

Veronica maideniana, a synonym of *Parahebe derwentiana* (Andr.) Briggs et Ehrendorfer.

Menzel, O.E.

He sent seeds and specimens to Botanic Gardens, Sydney, about 1900.

Michael, N. (Rev.)

Collector of the holotype of *Hakea incrassans* Gandoger, Port Jackson district, November, 1902, well-known for his collections from Queensland. Biographical data is not readily available and his name is apparently not listed in the registers of clergy for the major Christian churches. [? Lutheran].

Milligan, Joseph 1807–1883

Collector of Tasmanian plants. For biographical references see Barnhart, and Britten and Boulger.

Names published by Gandoger commemorating Milligan:—

Epacris impressa forma *milliganii.*

Leucopogon milliganii, a synonym of *Leucopogon ericoides* R. Br.

Moore, M.E. Miss

Sent various specimens to Botanic Gardens, Sydney, from Western Australia in 1899 and 1900.

Morrison, Alexander 1849–1913

Botanist, Department of Agriculture, Western Australia. The greater part of his herbarium is at Edinburgh, and duplicates of many of his collections are at Kew and Perth. For biographical references see Barnhart.

Name published by Gandoger commemorating Morrison:—

Leucopogon morrisonii, probably a synonym of *Leucopogon pulchellus* Sond.

Mueller, Ferdinand Jacob Heinrich 1825–1896

The greatest of resident botanists, director of the Botanic Gardens, Melbourne. For references to biographical data see Barnhart.

Name published by Gandoger commemorating Mueller:—

Davallia muelleri, a synonym of *Culcita dubia* (R. Br.) Maxon.

Pescott, Edward Edgar

Horticulturalist and prominent member of the Field Naturalists Club of Victoria. For biography see Hyam in Vict. Nat. LXXI (1955) 166–168.

Reader, F.M. ?1850–1911

His herbarium was acquired by the National Herbarium of Victoria before his death.

Name published by Gandoger commemorating Reader:—

Helichrysum semipapposum forma *readeri.*

Rumsey, H.J.

Collector of a syntype of *Dianella admixta* Gandoger and the holotypes of *Grevillea patulifolia* Gandoger and *Stypandra juncinella* Gandoger, all at Barbers Creek, New South Wales. Other collections of Rumsey's also made about 1898–1899 are represented in the National Herbarium of New South Wales.

St. John, Percival R.H. 1872–1944

A keen naturalist and prominent member of the Field Naturalists Club of Victoria. He was Head Gardener of the Botanic Gardens, Melbourne, from 1917, and later classifier in charge of the Economic Museum. For biographical data see Morris in Vict. Nat. LXI (1944) 95.

Scott

Possibly Dr Thomas Scott who collected in Tasmania about 1835. Scott collected the type of *Epacris impressa* forma *lucida* Gandoger at Mount Ramsay, Tasmania (ex Herb. Spicer).

Simson, Augustus 1836–1918

Collector in Tasmania. See Barnhart for references to biographical data.

Names published by Gandoger commemorating Simson:—

Olearia ramulosa forma *simsonii* Gandoger.

Rubus simsonianus, a synonym of *Rubus parvifolius* L.

Spicer, William Webb (Rev.) 1820–1879

A collector in Tasmania. His herbarium was purchased by Gandoger, see Gandoger in Bull. Soc. Bot. France XLVII (1900) 304. For biographical references see Barnhart, and Britten and Boulger. The numbers at the top of Spicer's herbarium labels examined during this study are herbarium reference numbers and not collection numbers. On some labels his name is abbreviated to "W.W.S.".

Names published by Gandoger commemorating Spicer:—

Hibbertia fasciculata forma *spiceri.*

Olearia ramulosa forma *spiceri.*

Sutton, Charles Stanford (Dr) died 1950

A keen Victorian amateur botanist. For brief biographical notes see [Willis] in Vict. Nat. LXVII (1950) 122.

Tenison Woods, J.E.

See Woods, Julian Edmund Tenison.

Tovey, James Richard 1873–1922

Botanical Assistant, National Herbarium of Victoria. Despatch of specimens to Gandoger was possibly arranged by Tovey. For a brief biographical note see [Anon.] in Vict. Nat. XXXIX (1923) 115.

Walter, Charles 1831–1907

Plant and seed collector in south-eastern Australia. His collection data are frequently unreliable. Gandoger may have received specimens directly from Walter, perhaps in 1902. The rubber stamp "Herbarium. Chas Walter 164 Queen St., Melbourne." appears on most of the labels, and indicates that Walter was not necessarily the collector, e.g. some of Walter's specimens in Gandoger's herbarium are from collections sent to Walter as exchange from the Botanic Gardens, Sydney (see *Petrophile obtusifida* Gandoger). For a brief biographical note see [Anon.] in Vict. Nat. XXIV (1907) 110.

Names published by Gandoger commemorating Walter:—

Epacris walteri, a synonym of *Epacris microphylla* R. Br.

Euphrasia walteri — the names *Euphrasia collina* R. Br. and *E. speciosa* R. Br. sens. lat. have been used for material resembling the type of *E. walteri.*

Grevillea walteri, a synonym of *Grevillea sphacelata* R. Br.

Microseris walteri, a synonym of *Microseris scapigera* (Soland. ex A. Cunn.) Schultz-Bip.

Persoonia walteri, a synonym of *Persoonia linearis* Andr.

Pimelea walteri, a synonym of *Pimelea axiflora* F. Muell.

Rubus walteranus, a synonym of *Rubus parvifolius* L.

Williamson, Herbert Bennett 1860–1931

Teacher, and active member of the Field Naturalists Club of Victoria. His personal herbarium is in the National Herbarium of Victoria. For a biography see Vict. Nat. XLVII (1931) 172–175, plate II.

Wilson, John Bracebridge 1828–1895

Headmaster of Geelong Grammar School, and enthusiastic natural historian. For biographical data see Maiden in Vict. Nat. XXV (1908) 116–117. Many of his collections are in the National Herbarium of Victoria.

Woods, Julian Edmund Tenison (Rev.) 1832–1889

Collector in many parts of Australia and south-east Asia. For biography and bibliography see [Stephens] in Proc. Linn. Soc. N.S.W. Ser. 2. IV (1890) 1301–1309.

Domin's "Beiträge zur Flora und Pflanzengeographie Australiens"

D.J. McGillivray

Karel Domin's "Beiträge" were published as parts, forming two volumes of Bibliotheca Botanica, and were based on collections and observations made during an extended visit to eastern Australia from the latter part of 1909 to mid-1910. Domin also referred to specimens collected by Amalia Dietrich in Queensland (1863–1873) and by Dr E. Clement in north western Australia in the first decade of this century. Domin's collections are housed in the Herbarium, Botanical Department of the National Museum at Pruhonice near Praha (Prague), Czechoslovakia.

The sub-title of the publication was given at its commencement as:—

> 1. TEIL: Systematische Bearbeitung des eigenen sowie auch fremden, besonders des von Frau Amalie Dietrich in Queensland (1863–1873) und von Dr. Clement in Nordwest—Australien gesammelten Materiales mit teilweiser Berücksichtigung der gesamten Flora Australiens.

A subsequent *Teil* was never published, and consequently the use of the term in citations is usually unnecessary.

Bibliographical information about the work is available from manuscript notes in some herbaria, and in the following references, viz., Novák 1931; Steenis 1949, 137; Steenis-Kruseman and Stearn 1954, CLXXVIII, and Stafleu 1967, 110. Individually none of these references provides complete information on the form of the publication and the dates of issue; it is the aim of this short paper to bring together the known facts.

The following table includes details of parts, pagination and plates, with information about dates of issue from Novák, 1931, and *Naturae Novitates*, 1914–1930:—

Domin, Karel (1882–1953).

Beiträge zur Flora und Pflanzengeographie Australiens.

Bibliotheca Botanica, Bande XX and XXII. Stuttgart. (1913) 1915–1929.

Band XX, Heft 85, Abteilung 1: Pteridophyta.

Lieferung	Pages	Plates	Date on Cover	Novák	Naturae Novitates
1	1–120	I–IV	1915	1913	Oct 1914
2	121–240	V–VIII	1915		Jan 1915

Band XX, Heft 85, Abteilung 2: Embryophyta siphonogama, pars I: Gymnospermae Monocotyledonae.

Lieferung	Pages	Plates	Date on Cover	Novák	Naturae Novitates
3	243–400	IX–XIII (IX, X col.)	1915	1915	Dec 1915
4	401–554	XIV–XVIII	1915		

[Hefte 86–88 contain papers by other authors.]

Band XXII, Heft 89, Abteilung 3: Embryophyta siphonogama, pars II: Dicotyledonae.

Lieferung	Pages	Plates	Date on Cover	Novák	Naturae Novitates
1	555–643	XIX–XXII	1921	1921	Jul 1921
2	645–741	XXIII–XXV	1925	1925	Jan 1926
3	741 bis–840	XXVI–XXVIII	1926	1926	Oct 1926
4	841–936	XXIX–XXXI	1926	1927	Sep 1927
5	937–1032	XXXII–XXXIV	1928	1928	Apr 1928
6	1033–1128	XXXV–XXXVI	1928	1928	Sep 1928
7	1129–1200	XXXVII–XXXVIII	1929	1929	Dec 1929
8	1201–1317	— — — —	1929	1929	Feb 1930

The date on the cover of the copy of Abteilung 3, Lieferung 4 at the National Herbarium of New South Wales has been manually altered to 1927, possibly at the publisher's. The captions for plates XIX–XXXVIII are included in Lieferung 7. In Abteilung 3 the pagination in parenthesis is a separate numbering for that Abteilung (see the following notes on citation). A further reference to details of the parts is the Verzeichnis (Table of Contents by Hefte) on the back cover of each Lieferung.

The year of issue of Abteilung 1 is confirmed by Bailey 1913 in a review of Domin's taxonomy relating to Queensland's Pteridophyta. Bailey's Prefatory Notice is dated October 1913, and it is therefore likely that the publication was issued in Germany not later than the middle of that year. In his *Vorwort* to the Beiträge Domin states that the manuscript was ready for printing in July 1912.

SUGGESTIONS ON CITATION OF THE PUBLICATION

The most satisfactory form of citation would seem to be:—

Biblioth. Bot. 20 (85^1): 000 (1913).
Biblioth. Bot. 22 (89^8): 1317 (1929).

As there is only one sequence each for the plates and the text-figures it seems advisable to follow the one sequence for pagination, in preference to citing the separate pagination for Heft 89. The use of the number of the Heft only, in place of the volume number, provides an alternative citation:—

Biblioth. Bot. 85: 000 (1913).
Biblioth. Bot. 89: 1317 (1929).

CONCLUDING NOTES

Domin's contribution to Eastern Australian botany balances, to some degree, the work done by Ludwig Diels and Ernst Pritzel (1904–05) in Western Australia, several years earlier. Although many of the names published by Domin have proved to be synonyms or are awaiting transfer to synonymy, his papers form a useful component of this country's taxonomy.

There are still opportunites for scientists outside this country to make significant contributions to the understanding of Australia's remarkable flora, and thus increase our knowledge of the world's living resources.

ACKNOWLEDGEMENTS

I am indebted to my colleague Mrs Alma T. Lee whose manuscript notes in our copies of the publication have corrected and enlarged the information previously available. My thanks are due also to Dr S.T. Blake of the Queensland Herbarium, for data about the copy of the publication held at that institution.

LITERATURE CITED

Bailey, F.M., 1913. — Contributions to the Queensland flora. Bot. Bull. Queensland XVII.

Diels, L. and E. Pritzel, 1904–05. — Fragmenta phytographiae Australiae occidentalis. Bot. Jahrb. Syst. XXXV, 55–662.

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Stafleu, F.A., 1967. — *Taxonomic Literature.* Utrecht.

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Steenis-Kruseman, M.J. van and W.T. Stearn, 1954. — Dates of publication. List of works and serials. Fl. Malesiana IV (5), CLXVI–CCXIX.

The Handwriting of Richard Salisbury (1761-1829) (and Some Incidental Notes)

D.J. McGillivray

SUMMARY

The resemblance of Salisbury's script to that of Jonas Dryander is demonstrated and explained. Examples are given of Salisbury's and Dryander's writing. Dating of Salisbury's manuscripts and drawings is assisted by knowing that his style of writing changed markedly in the year 1790. This paper also contains some incidental bibliographic and nomenclatural notes.

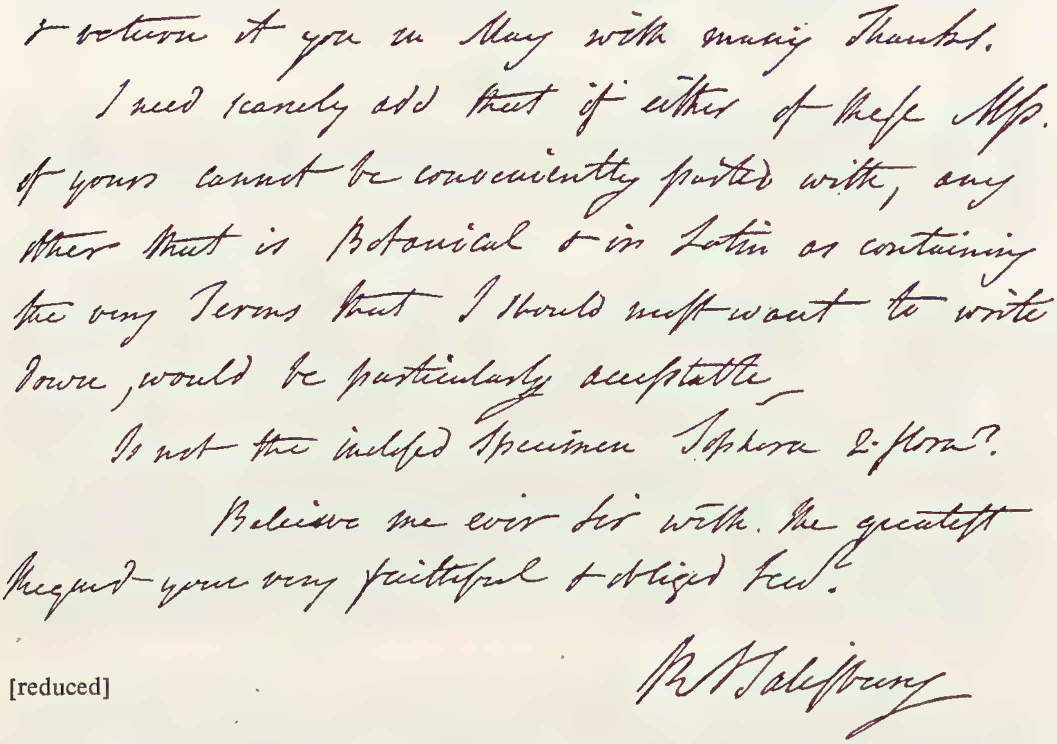
Richard Salisbury is remembered by many botanists, especially those who have worked on the family Proteaceae, for his apparent misappropriation of Robert Brown's paper "On the natural order of plants called Proteaceae" read before the Linnean Society of London on 17th January, 1809 and published under the title "On the Proteaceae of Jussieu" in the Society's Transactions, volume 10, part 1, on 8 March 1810 (see Raphael 1970, 75). [In Stafleu (1967) 54 the paper is incorrectly cited under its original title (this is also the title given in the Ray Society's reprint, see Brown 1866–68) and treated as a preprint. Consistency between the copies of this part of the Transactions in the libraries of the British Museum (Natural History), the Royal Society of London and the Royal Botanic Gardens, Kew, tends to confirm that the paper was first issued in the Transactions of the Linnean Society. The absence of any preprint in the above-mentioned and other libraries supports this.]

Salisbury was present when Brown's paper was read. Apparently the occasion stimulated him to name and describe many of the species already presented by Robert Brown. Simmonds (1940) 96 suggests that Salisbury did this "perhaps partly out of resentment" after J.E. Smith's mistreatment of *Hookera* Salisb. (III.1808), [non Smith V.1808]; Salisbury was then 48 years of age, and twelve years older than Brown. The names and descriptions were published at the end of 1809, with a claim to originality and an indirect acknowledgement of Salisbury's participation, in Joseph Knight's "On the cultivation of the plants belonging to the natural order of Proteeae". For observations and comments on this episode see Britten (1886); Simmonds (1940) 96–97; Stearn (1960) xxxii; Rourke (1969) 325 [in which an apparently superfluous name was published, viz. *Leucospermum rodolentum* (Knight) Rourke for *L. candicans* Sweet].

It may not be generally known that Salisbury's manuscripts which Knight "found so useful in every sheet" were in a script which closely resembled that of Jonas Dryander, who was Sir Joseph Banks' librarian from 1782–1810 (a position to be occupied by Robert Brown on Dryander's death in 1810). The reason for this similarity of script is shown in a letter from Salisbury to Dryander dated 17 Jan 1790, (British Museum (Natural History), Dryander Correspondence, MS); Salisbury was then 28 years of age.

> Dear Sir,
>
> I want to borrow your Paper upon Begonia, for which Purpose I have written to Smith [J.E. Smith, an associate and formerly an acquaintance of Salisbury's at Edinburgh University] to know if it is practicable, not only for the Matter of it which is superior to most Linnean Productions of that Sort, but for the Handwriting which I am become anxious to imitate.

I am plagued excessively with copying my Hortus & Genera for the Press & in the End it will be the least Trouble I believe to go to School again as it were & endeavour to acquire a totally different Manner of making my Letters — For this Purpose if you have the Manuscript Copy or any Part of it, of the Hortus Kewensis, & will trust it with me 2 or 3 months I will treat it as the greatest Treasure & return it to you in May with many Thanks.



& return it you in May with many Thanks.

I need scarcely add that if either of these MSS. of yours cannot be conveniently parted with, any other that is Botanical & in Latin as containing the very Terms that I should most want to write down, would be particularly acceptable

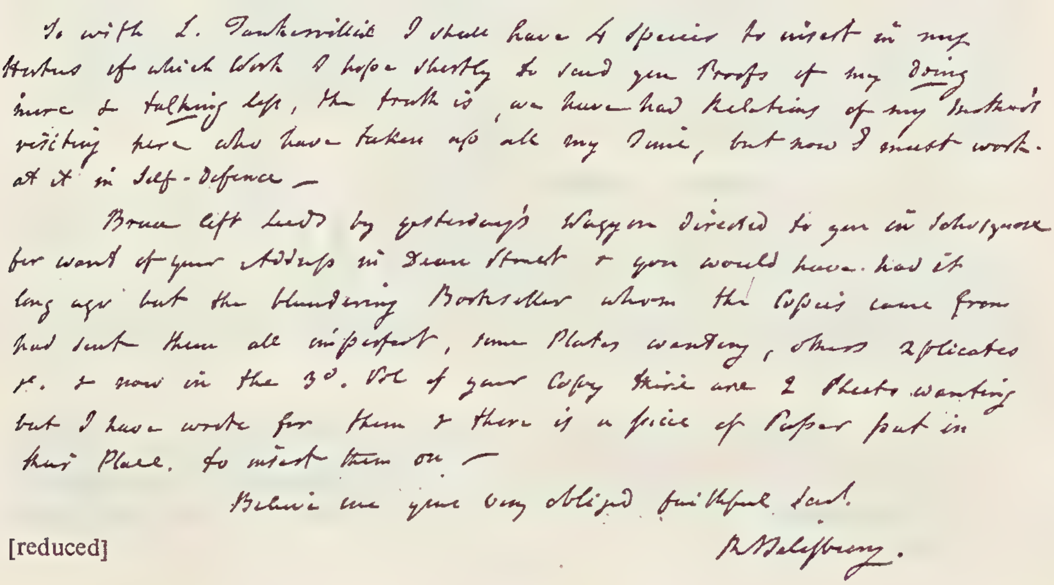
Is not the inclosed Specimen Sophora 2-flora?

Believe me ever Sir with the greatest Regard your very faithful & obliged Servt.

R A Salisbury

[reduced]

Dryander answered the letter on 25th January (see Dryander annotation on letter "answ. Jany 25."), apparently acceding to the request, for Salisbury's next letter in the Dryander Correspondence, dated 23rd June, 1790 shows a marked change in script to a form closely resembling the writing of Dryander.



So with L. Tankervilliae I shall have 4 Species to insert in my Hortus of which Work I hope shortly to send you Proofs of my *doing* more & *talking* less, the truth is, we have had Relations of my Mother's visiting here who have taken up all my Time, but now I must work at it in Self-Defence —

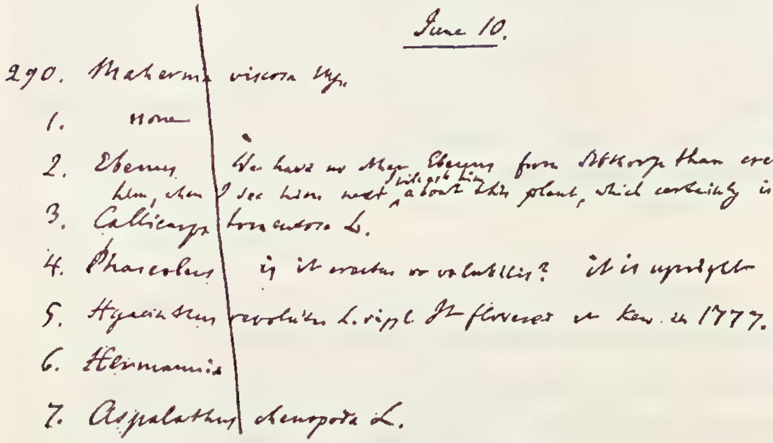
Bruce left Seeds by yesterday's Waggon directed to you in Sohosquare. for want of your Address in Dean Street & you would have had it long ago but the blundering Bookseller whom the Copies came from had sent them all imperfect, some Plates wanting, others duplicates &c. & now in the 3d. Vol of your Copy there are 2 Sheets wanting but I have wrote for them & there is a piece of Paper put in their Place, to insert them on —

Believe me your very obliged faithful Servt.

R A Salisbury.

[reduced]

The following example of Dryander's script from the Day Book of the Royal Garden at Kew for 10 June 1790 (British Museum (Natural History), MS) illustrates the similarities.



June 10.

290. Mahernia viscosa Wg.
1. none
2. Ebenus | We have no other Ebenus from Sibthorp than cretica & pinnata. I will ask him, when I see him next, [illegible] about this plant, which certainly is not properly in flower
3. Callicarpa tomentosa L.
4. Phaseolus | is it erectus or volubilis? it is upright
5. Hyacinthus revolutus L. suppl. It flowered at Kew in 1777.
6. Hermannia
7. Aspalathus chenopoda L.

[reduced]

This script is frequently seen in manuscripts and on specimens from the Banksian herbarium, although it is not so much in evidence as the manuscripts and notes made by Daniel Solander (on whose death, in 1782, Dryander became Banks' librarian). [Ewan (1969) has attributed Dryander's script to Solander in captions to some of the plates.]

It is unlikely that botanists who are familiar with the works of Dryander and of Salisbury would confuse their scripts, but one who is acquainted with only one or the other may be led into error.

The marked change in Salisbury's script in 1790 assists in dating his manuscripts, notes and illustrations, e.g. annotations in books from Salisbury's library and the volumes of illustrations and notes (bound in systematic order) housed in the library of the Botany Department, British Museum, (Natural History). These notes and illustrations were inherited by William John Burchell (1782–1863), Salisbury's appointed heir, and left to Burchell's sister, Miss N. Burchell, in 1863. Miss Burchell gave them to J.E. Gray (Keeper of the Zoological Department, British Museum), who donated them to the British Museum in 1865, from whence they came to the British Museum (Natural History). (Mr J.R. Sealy, pers. comm. 1954, see Acknowledgements).

Rourke (1969) 325, draws attention to the nomenclatural types of names published in Knight's "Proteeae". These are among the South African and South American collections from Salisbury's herbarium which came to Kew in 1865 from Miss Burchell (see letter to W.J. Hooker dated 12 August 1865 [the day Hooker died] in W.J. Hooker's correspondence volume XLI); (Mr J.R. Sealy, pers. comm. 1954).

The Botany Department, British Museum (Natural History) also contains some of "Knight's" types. In 1969–70 the author observed type collections of *Lysanthe speciosa* Knight (from Rudge's herbarium), *Grevillea pteridiifolia* Knight, *G. parallela* Knight and *G. glauca* Knight (from the Banksian herbarium).

ACKNOWLEDGEMENTS

I am grateful to Mr R. Ross, Keeper, Botany Department, British Museum (Natural History) for allowing me to examine various books and manuscripts in the library of the Botany Department. The assistance of Miss Phyllis I. Edwards, Librarian and other members of the Department's staff added to the pleasures of learning and studying among the invaluable collections there. Also I wish to thank Dr Nancy T. Burbidge and Mr J.R. Sealy for information about Salisbury which Dr Burbidge received from Mr Sealy in 1954 (referred to in this paper as Sealy, personal communication 1954). The reproductions from manuscripts held in the British Museum (Natural History) have been made with the kind permission of the Trustees.

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A New Australian Species of *Maytenus*

N.S. Lander and L.A.S. Johnson

SUMMARY

The new species *Maytenus silvestris* (Celastraceae) is described and discussed in relation to two closely allied species, *M. bilocularis* and *M. cunninghamii.* A note is provided on the synonymy of *M. cunninghamii.*

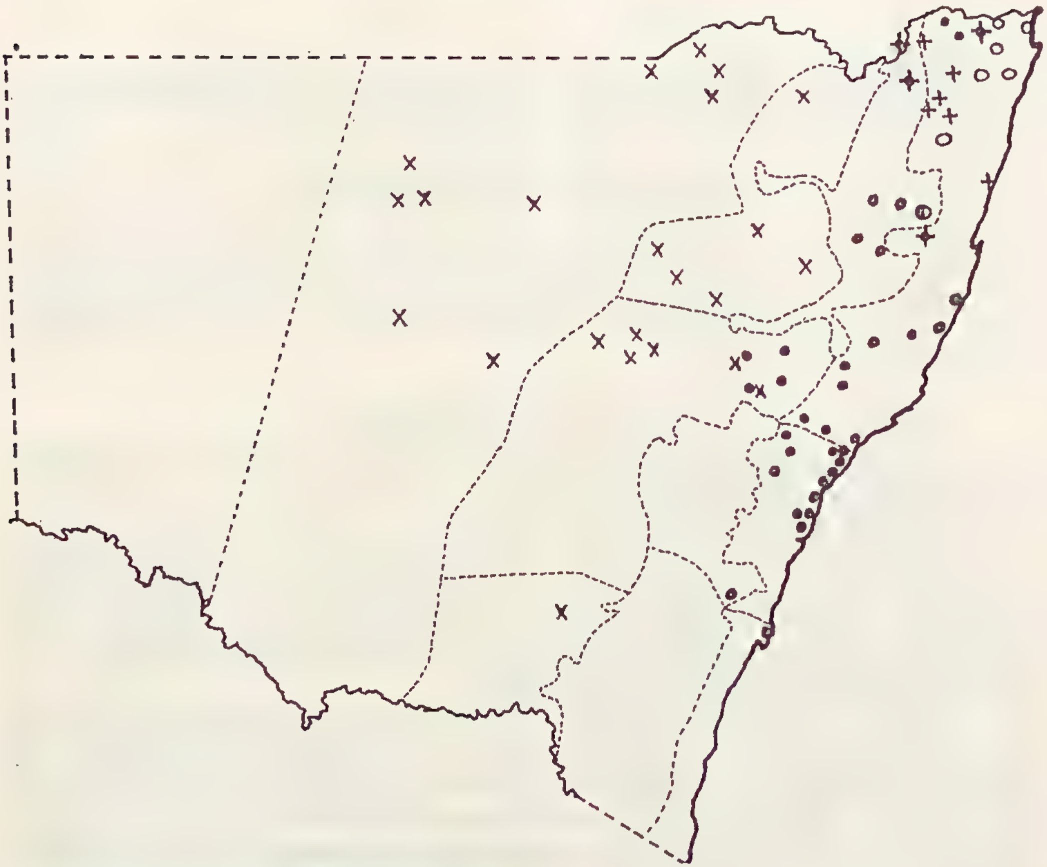
Maytenus silvestris *N. Lander et L. Johnson*, **sp. nov.**

Holotype: Nepean River, Douglas Park, 6 miles (10 km) E. of Picton, New South Wales, E.F. Constable 6222, 13.10.1965 (NSW).

Isotypes to be distributed to A, BRI and MEL.

Species affinis *M. cunninghamii* et *M. bilocularis*; a prima differt habitu fruticoso et foliis discoloribus marginibus recurvatis plerumque dentatis venatione plus aperta; a secunda differt habitu patenti foliis anguste lanceolatis ovatis obovatisve plerumque apicem versus falcatis et marginibus minute dentatis etiam bracteis pedicellorum marginibus haud ciliatis.

Low spreading shrub to small tree, 0·3–4·5 m high, mostly glabrous, sometimes young branches, pedicels and bracts covered by a light brown indumentum; bark grey on older branches, younger branchlets red and covered in minute lenticels. *Leaves* scattered, shortly petiolate, narrowly lanceolate, ovate or obovate, 1·0–8·0 cm long, 0·15–1·30 cm wide, often falcate towards the tip, coriaceous, dark green above, pale below, entire or minutely dentate with 1–10 teeth on the margin of each leaf, recurved, acute, ± mucronate, venation reticulate with nerves and network of veins almost equally evident on both surfaces. *Juvenile leaves* somewhat larger than those of mature plant, 6·5–10·2 cm long, 1·0–1·8 cm wide, often coarsely toothed. *Inflorescence:* flowers borne in leaf axils singly or in clusters of 2 or 3, or in axillary or lateral racemes occasionally growing out into leafy branches. *Pedicels* slender, 5·0–10·0 mm long, c. 1·0 mm wide at the base tapering to c. 0·5 mm at the flower; each subtended by an acute, triangular, brown bract 0·5–1·5 mm long and c. 0·5 mm wide at the base. *Bracteoles* minute, opposite, situated 1/5–1/2 the length of the pedicel from its base. *Flowers* 5-merous, pale green, 4·0–5·5 mm in diameter. *Sepals* basally connate, persistent, broader than long, 0·8–1·0 mm long, 0·5–1·0 mm wide, obtuse. *Petals* spreading, broadly ovate, 1·5–2·0 mm long, 0·8–2·0 mm wide, contorted in the bud. *Filaments* 5, opposite the sepals, inserted on the outside of the floral disc, 1·25–2·00 mm long, c. 0·5 mm wide at the base tapering towards the anthers. *Anthers* dorsifixed, spherical, c. 0·3 mm in diameter, 2-locular, each loculus dehiscing by a longitudinal slit. *Floral disc* 1·00–1·75 mm in diameter, fleshy. *Ovary* superior, semi-immersed in the disc, 2-locular, smooth, glabrous; ovules 2 in each loculus, upright, attached to the base of the septum. *Style* terminal on the ovary, c. 0·5 mm long, divided into 2 broad, strap-shaped, spreading lobes. *Fruit* a coriaceous capsule, spheroid or ellipsoid or obovoid, 3·5–7·0 mm long, 3·5–8·0 mm wide, yellow when fresh, brown when dry, smooth, 2-locular, dehiscing loculicidally into 2 parts. *Seeds* 1–4 in each fruit, ovate or plano-convex in cross-section, 4·0–5·0 mm long, 2·5–4·5 mm wide, shiny brown; aril completely surrounding the seeds, green, membranous.



Map 1. Distribution in New South Wales of:—

o *M. bilocularis* × *M. cunninghamii*

● *M. silvestris* + *M. silvestris* × *bilocularis*

Note that *M. cunninghamii* is found in Western Australia, the Northern Territory and northern Queensland as well as the regions indicated above.

◆

Distribution: South-east ("Granite Belt") of Darling Downs of Queensland, probably extending further northwards; North Coast, Northern Tablelands, Central Coast and far east of the Central Tablelands and Central Western Slopes of New South Wales. See map 1.

Habitat: in the moister types of sclerophyll forests on a variety of soils.

Flowering Period: October to January, with one record for April.

Specimens Examined: (at NSW unless otherwise indicated): Queensland: *Darling Downs:* Bald Mountain, 4 miles (6·5 km) N. of Wallangarra, Constable NSW 126532, 5.1961; Wallangarra, Boorman NSW 126531, 7.1904; NSW 126530, 11.1904; NSW 126534, 1.1906. New South Wales: *North Coast:* Acacia Creek, via Killarney, Dunn NSW 126520, 3.1906; Unumgar State Forest, 20 miles (32 km) NW. of Kyogle, Coveny 1665, 7.1969; Tooloom, Cambage 2903, 9.1911; about 6 miles (10 km) along fire trail from forestry hut in Carrai State Forest, about 35 miles (56 km) WNW. of Kempsey, Coveny 402, 7.1968; Port Macquarie, Boorman NSW 126545, 2.1898; Black Creek, near Kendall, Whaite NSW 126546, no date; Kendall Fire Hut, Whaite NSW 126547, 1.1950; Bulga State Forest, about 25 miles (40 km) NW. of Taree, Burgess 764, 4.1963; Ellenborough Falls, 20 miles (32 km) NW. of Taree, Constable 6301, 11.1965; Coneac district, Fraser and Vickery NSW 126535, 11.1936; Bowman and Barrington Rivers, Maiden NSW 126536, 9.1897; Gloucester, no collector, NSW 126538, 1865; Brushy Mts near Gloucester, Maiden NSW 126537, 9.1897; 4 miles (6 km) SE. of Gloucester on Waukivory road, Johnson NSW 126542, 11.1968; Upper Williams River, Fraser NSW 126539, 8.1933; Allyn Valley, Lawson, 1.1925 (SYD); Singleton District, Seddon NSW 126540, 3.1938;

Paterson, Rupp NSW 126549, 11.1924; Darkey Creek, about 25 miles (40 km) S. of Singleton along Putty road, Martin, 11.1967 (SYD); Pokolbin, Cambage NSW 126548, 4.1906; Fairburn, 9 miles (14·5 km) NE. of Wollombi, McRae NSW 126524, 3.1933; Merewether Hills S. of Newcastle, Cambage 581, 10.1901. *Northern Tablelands:* Acacia Plateau, Constable 3551, 5.1957; Mt Capoompeta, 23 miles (36 km) S. of Tenterfield, Constable 7091, 8.1966; 9 miles (14·5 km) NE. of Wollomombi, McKie NSW 126523, 3.1933; pine forest near Armidale, Davis NSW 126522, 11.1954; Styx River, Boorman NSW 126525, 1.1907; Walcha district, Maiden NSW 126529, 11.1897; Betche NSW 126526, 12.1898; Apsley Falls, 12 miles (19 km) E. of Walcha, Hadley NSW 52728, 2.1937; Apsley Falls, Davis NSW 126528, no date; Apsley Falls, Johnson NSW 126489; NSW 126527, 5.1957; Mount Royal, Leichhardt NSW 126543, 1847. *Central Coast:* Mt Kindarun, 14 miles (22·5 km) NNW of Putty, Johnson and Constable NSW 48270, 9.1959; Toronto, Lake Macquarie, Lucas and Hamilton NSW 126492, 1.1918; Hunters Lookout, Wattagan Mountain, Coveny NSW 126487, 3.1966; Avondale, 3 miles (5 km) W. of Dora Creek, Constable NSW 30731, 9.1954; 6 miles (10 km) NW. of Morisset, Story 6678, 9.1959; Olney State Forest, Constable NSW 11534, 8.1949; Mogo Creek, 15·5 miles (26 km) by road from St. Albans, Pickard 966, 4.1970; Wyong, Boorman NSW 126493, 12.1898; Narara, Fletcher NSW 126495, 11.1892; Wamberal, Martin NSW 126494, 6.1891; Gosford, McBarron 17775, 8.1969; Blackwell Mount, Woy Woy, McBarron 17680, 8.1969; Kincumber, Maiden NSW 126496, 7.1905; Hawkesbury River, Cleland NSW 126497, 8.1912; Kurrajong Heights, Cleland NSW 126499, 8.1912; Church Point, Fraser and Vickery, 11.1933 (SYD); Newport, Ford NSW 126498, 4.1946; Hornsby, Deane NSW 126500, no date; The Valley, Hornsby, Blakely, NSW 126490, 4.1914; Warrawee, Blakely NSW 126501, 10.1914; National Forest, St. Ives, Johnson NSW 20956, 12.1952; Terrys Creek, Epping East, Johnson NSW 126502, 7.1949; Northbridge, McKee NSW 126505, 11.1951; Ryde, Fletcher NSW 126503, 1880–1890; Parramatta River, Boorman NSW 126506, 4.1903; R.A.N. Armaments Depot, Newington, Parramatta River, Johnson NSW 121159, 10.1964; Parramatta, Betche NSW 126507, 12.1883; Port Jackson, R. Brown NSW 126509, 1802–5; Brays Bay, Concord, Evans, 3.1933 (SYD); Queens Park, Waverley, Cheel NSW 126510, 9.1899; Hurstville, Camfield NSW 126515, 10.1897; NSW 126514, 1.1899; Peakhurst, Cheel NSW 126512, 12.1898; NSW 126513, 1.1899; NSW 126511, 1.1899; Penshurst, Fletcher NSW 126516, 5.1890; Camfield NSW 126517, 11.1896; Georges River, Cabramatta, Constable NSW 7695, 2.1949; Liverpool Cemetery, McBarron 11477, 11577, 11579, 11.1965; Brickmakers Creek, Liverpool, McBarron 11586, 11.1965; Georges River Reserve, Ingleburn, McBarron 13658, 12.1966; Razorback Range, Camden – Picton, Constable NSW 126518, 4.1957; Razorback Range, Wilson 548, 549, 4.1957; Nepean River, Douglas Park, 6 miles (10 km) W. of Picton, Constable 6222, 10.1965. *Central Tablelands:* about 2·5 miles (4 km) N. of Mt Coricudgy, E. of Rylstone, Rodd and McGillivray NSW 126488, 4.1965; Nyes Creek, Wingello, McGillivray NSW 126519, 5.1959. *Central Western Slopes:* Pages River, Maiden NSW 126544, 1899; 5 miles (8 km) E. of Aberdeen, Story 7097, 3.1960; near Sandy Hollow, 20 miles (32 km) SW. of Muswellbrook, Story 6619, 8.1959; Cedar Creek, Widdin Valley, SW. of Denman, Constable NSW 42813, 9.1957; slopes NW. of Emu Creek, 4 miles (6 km) SW. of Widden, Johnson NSW 126451, 11.1955.

Maytenus silvestris is a well-known but previously undescribed species. It has often been confused with *M. cunninghamii* (Hook.) F. Muell. which it resembles closely in herbarium material. Mueller, in Trans. Vict. Inst. III (1859) 30, cited a specimen from Port Jackson when making the combination *Celastrus cunninghamii.* Bentham, in Fl. Austral. I (1863) 399, cited under *C. cunninghamii* specimens from Port Jackson, the Hunter, Hastings, Clarence and Macleay rivers, New England, Penrith and Parramatta. As can be seen from Map 1, these localities fall well outside the range of *M. cunninghamii* and well within that of *M. silvestris.*

Beadle, Evans & Carolin, in Handb. Vasc. Pl. Sydney Dist. (1963) 303, misapply the name *M. cunninghamii* to *M. silvestris.*

These two species are quite distinct, *M. silvestris* being a small to large shrub, rarely a small tree, whereas *M. cunninghamii* is a small to medium sized tree. The leaves of *M. silvestris* are always at least slightly recurved, usually toothed at the margins, more open in venation and often much darker on their upper surfaces with the lower surfaces grey-green, whereas those of *M. cunninghamii* are never recurved, entire, rarely slightly darker on their upper surfaces and usually bright green on both surfaces. They are distinct in their distributions, overlapping only on the far north east of the Central Western Slopes as shown by Map 1. There are no intermediates.

M. silvestris is probably more closely related to *M. bilocularis* (F. Muell.) Loes. with which it appears to hybridize. Intermediates are known from the Darling Downs of Queensland and from the far North Coast and Northern Tablelands of New South Wales where the two species overlap. The distribution of intermediates is indicated on Map 1.

Specimens of *M. silvestris* × *bilocularis* Examined (at NSW unless otherwise indicated): Queensland: *Darling Downs:* Wallangarra, Betche NSW 126477, 12.1891; Boorman NSW 126478, 10.1901. New South Wales: *North Coast:* Unumgar State Forest, 20 miles (32 km) NW. of Kyogle, Coveny 1668, 7.1969; Wilsons Downfall, Cambage 2817, 9.1961; 30 miles (48 km) from Tenterfield on Tenterfield–Casino road, Hassey NSW 126479, 11.1932; Bungabbee State Forest, McAuliffe NSW 126483, 4.1921; Gibraltar Range State Forest, Constable NSW 126480, 5.1961; Purgatory Creek, 7 miles (11·3 km) NW. of Ramornie, Blakely and Shiress NSW 126476, 7.1922; Upper Copmanhurst, Rupp NSW 126486, 6.1911; Coramba, Boorman NSW 126484, 11.1912; Georges Creek, Upper Macleay River, Davis NSW 126485, 1.1941. *Northern Tablelands:* Tenterfield to Sandy Flat, Maiden NSW 126481, 12.1898.

Note on the Synonymy of *Maytenus cunninghamii*

Maytenus cunninghamii (Hook.) Loes. in Pflanzenfam. XXb (1942) 136 "(F. Muell.) Loes."
Catha cunninghamii Hook. in Mitch. Trop. Austral. (1848) 387.
Celastrus cunninghamii (Hook.) F. Muell. in Trans. Vict. Inst. III (1859) 30.
Gymnosporia cunninghamii (Hook.) Loes. in Pflanzenfam. XXb (1942) 136, pro syn.

Holotype: On the Mooni in latitude 28° 17′ 51″ S., Queensland, 622 ft. above sea level, T.L. Mitchell 17.11.1846 (K).

Celastrus cunninghamii var. *parvifolia* F.M. Bailey in Queensl. Agr. J. XXIX (1912) 22.

Celastrus baileyanus Domin in Bibl. Bot. LXXXIX (1927) 894.

Holotype: Chinchilla, Queensland, R.C. Beasley 8.7.1912 (BRI).

In his revision of the genus *Celastrus* in Ann. Missouri Bot. Gard. XLII (1955) 215–302, Ding Hou cited *C. cunninghamii* var. *parvifolia* in his synonymy for *M. cunninghamii*; he appears to have been unaware of Domin's *C. baileyanus*. Mr D.J. McGillivray (pers. comm.) has examined the type of *C. baileyanus* and compared it with an isotype of *M. cunninghamii*; he reports that these are *not* significantly different.

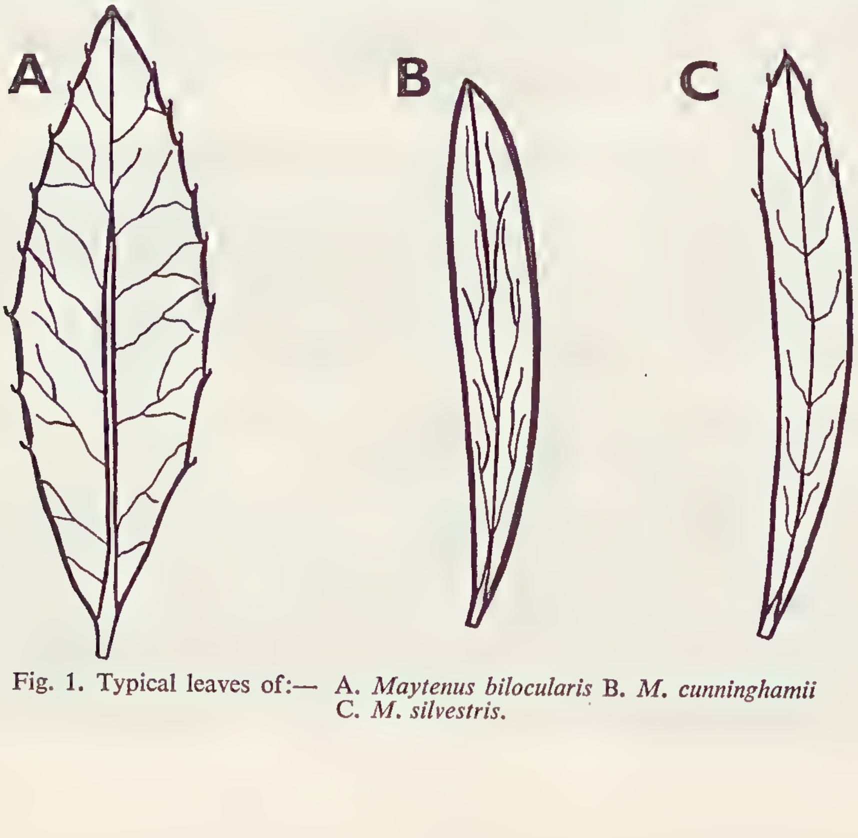


Fig. 1. Typical leaves of:— A. *Maytenus bilocularis* B. *M. cunninghamii* C. *M. silvestris.*

Key to the Species Discussed

1. Leaves grey-green below, mostly darker above; margins usually toothed, always slightly recurved.
    2. Leaves usually falcate towards the tip, narrowly lanceolate, ovate or obovate .... *M. silvestris*
    2.* Leaves never falcate, broadly lanceolate .... *M. bilocularis*

1.* Leaves bright green, rarely darker above; margins always entire, never recurved .... *M. cunninghamii*

ACKNOWLEDGEMENTS

We wish to thank Mrs Robin Cameron for preparing the map and Mrs Dale Gray for drawing the leaves of *Maytenus*.

Cyperus brevifolius and an Allied Species in Eastern Australia

L.A.S. JOHNSON AND O.D. EVANS

SUMMARY

Two species are distinguished amongst material formerly referred to *Cyperus brevifolius* and a new name *C. sphaeroideus* is provided for one of these in place of *Kyllinga intermedia* R. Br. (non *Cyperus intermedius* Guss.)

In the course of preparatory investigations of the genus *Cyperus* for the Flora of New South Wales it was found that in this State there are two distinct species which have been included in *C. brevifolius* (Rottb.) Hassk. These were indeed distinguished by Robert Brown (1810) under the names *Kyllinga monocephala* Rottb. (= *C. brevifolius*) and *K. intermedia* R. Br. The latter epithet cannot be used under *Cyperus* because of earlier homonyms. Both species have been studied from living plants as well as herbarium specimens. They may be distinguished as follows:

1. Head more or less ovoid, single or with two smaller ones at base, 6–7 mm diam., 6–8 mm long. Spikelets numerous, sometimes about 100 in number, 1-flowered. Glumes greenish. Keel prominent, slightly winged, usually denticulate. Stamen 1. .... *C. brevifolius*

1.* Head globular, always solitary, 4–6 (7) mm diam. Spikelets not usually above 50 in number, radiating; a second, incomplete flower often present. Glumes tending to yellowish, often tinged with gold. Keel smooth or nearly so, rarely denticulate. Stamens 2–3 .... *C. sphaeroideus*

Cyperus sphaeroideus *L. Johnson et O. Evans*, **nom. nov.**

Kyllinga intermedia R. Br., Prodr. Fl. Nov. Holl. (1810) 219; nec *Cyperus intermedius* Guss. (1832) nec *C. intermedius* Steud.

Cyperus brevifolius (Rottb.) Hassk. var. *stellulatus* (Suringar) Kükenth. in Pflanzenr. IV, 20 (Heft 101), (1936) 603.

DISTRIBUTION: From eastern Queensland, through New South Wales (North and Central Coast; Northern, Central and Southern Tablelands; North Western and Central Western Slopes) to Victoria. Whether this species occurs beyond Australia is not at present certain.

C. sphaeroideus is much less weedy than *C. brevifolius* and, unlike that species, is usually found in relatively undisturbed habitats.

ACKNOWLEDGEMENTS

Dr S.T. Blake, of the Queensland Herbarium, has been most helpful in discussions and in the provision of information. Our thanks are due to Mr John Lewis of the British Museum (Natural History) for comparing recent material with Robert Brown's type.

REFERENCE CITED

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New Taxa and Combinations in Eucalyptus—II

L.A.S. JOHNSON AND D.F. BLAXELL

SUMMARY

The following combinations are published: *E. macrorhyncha* ssp. *cannonii*, *E. pauciflora* ssp. *niphophila*, *E. pauciflora* ssp. *debeuzevillei*, *E. radiata* ssp. *robertsonii*, *E. piperita* ssp. *urceolaris* and *E. andrewsii* ssp. *campanulata*. *E. haemastoma* var. *sclerophylla* is raised to species rank as *E. sclerophylla*. The new name *E. gregsoniana* is published for the taxon *E. pauciflora* var. *nana*. A new species *E. paliformis* is described. All these taxa occur in south eastern Australia.

As explained in the previous paper in this series (Johnson and Blaxell, 1972) the code designations preceding the names of the taxa are those used in the system of classification of Pryor and Johnson (1971).

MAHACB **Eucalyptus macrorhyncha** *F. Muell. ex Benth.* ssp. **cannonii** (*R.T. Baker*) *L. Johnson et D. Blaxell* **comb. et stat. nov.**

BASIONYM: *Eucalyptus cannonii* R.T. Baker, The Hardwoods of Australia (1919) 200.

LECTOTYPE: Mt Vincent, Rylstone District, New South Wales, R.T. Baker, 11.1892 (Museum of Applied Arts and Sciences, Sydney).

ISOLECTOTYPE: NSW 132543 (NSW).

A lectotype has been chosen from the syntypes held in the Museum of Applied Arts and Sciences, Sydney. These are:

(1) as cited above (flowers and loose fruit)
(2) Rylstone, R.T. Baker, 9.1895 (buds and flowers)
(3) Mt Vincent, G. Harris, 4.1914 (buds and young fruit)
(4) Woodlands, Ilford, G. Harris, 10.1917 (buds, loose fruit and intermediate foliage)

Of these we have chosen the most complete specimen of the four and the more complete specimen of those collected by Baker. He mentions both collectors in his protologue.

DISTRIBUTION: Confined to the Rylstone—Capertee district of New South Wales in an area where both basaltic and sandstone soils are found. Its precise occurrence with relation to soil type is yet to be determined. This subspecies does intergrade with the vastly more widespread type subspecies where their ranges overlap.

MAKHAC **Eucalyptus pauciflora** *Sieber ex Spreng.* ssp. **niphophila** (*Maiden et Blakely*) *L. Johnson et D. Blaxell* **comb. et stat. nov.**

BASIONYM: *Eucalyptus niphophila* Maiden et Blakely in Maiden, Crit. Rev. Gen. Euc. VIII (1929) 34.

HOLOTYPE: Pretty Point, Mt. Kosciusko, New South Wales, J.H. Maiden & W. Forsyth NSW 132544, 1.1899 (NSW).

DISTRIBUTION: Subalpine regions of New South Wales and Victoria. It is not known from Tasmania in which State only ssp. *pauciflora* occurs. In many areas of the Australian Alps, in the lower part of the subalpine zone, extensive populations occur which are intermediate in character between ssp. *niphophila* and the montane forest form of ssp. *pauciflora*.

MAKHAD **Eucalyptus pauciflora** *Sieber ex Spreng.* ssp. **debeuzevillei** (*Maiden*) *L. Johnson et D. Blaxell* **comb. et stat. nov.**

BASIONYM: *Eucalyptus debeuzevillei* Maiden in J. Roy. Soc. N.S.W. LIV (1920) 68.

HOLOTYPE: Jounama Peaks, Bogong Mountains, New South Wales, W.A.W. de Beuzeville NSW 132547, 12.1919 (NSW).

DISTRIBUTION: Southern Tablelands of New South Wales in a few localities only at altitudes of c. 1500 m: (I) from the type area north of Yarrangobilly; (II) South of Cabramurra on the south side of Tumut Pondage; (III) Brindabella Range, A.C.T.

Intergrading populations are found between the three subspecies *pauciflora*, *niphophila* and *debeuzevillei* in the contact zones. Pryor (1957) and Green (1969) described and discussed variation in *E. pauciflora* sens. lat.

MAKHF **Eucalyptus gregsoniana** *L. Johnson et D. Blaxell* **nom. et stat. nov.**

REPLACED SYNONYM: *Eucalyptus pauciflora* Sieber ex Spreng. var. *nana* Blakely, Key Euc. (1934) 339.

LECTOTYPE: Clarence to Wolgan, New South Wales, J.H. Maiden NSW 132545, 11.1906 (NSW).

This specimen has been chosen as lectotype, since it is from the range of localities known to Blakely and it is the most complete specimen now available of those seen by him (Blakely did not provide any precise citation of specimens in his protologue).

DISTRIBUTION: Central and Southern Tablelands of New South Wales. Mt Wilson to Newnes Junction and Blackheath in the Blue Mountains west of Sydney, and the Budawang Range area south west of Nowra. It is always found as a mallee community on shallow soils over sandstone or other siliceous rock, often surrounded by *Casuarina nana* heath.

We do not treat this taxon as a subspecies of *E. pauciflora*, since it does not intergrade with that species where the two occur in close proximity. In fact, *E. gregsoniana* and *E. pauciflora* ssp. *pauciflora* do not appear to inhabit the same ecological niche even though both occur in the areas listed above. A comparable situation can be found with other "tree/mallee pairs" e.g. MAKED *E. sieberi*/MAKEE *E. multicaulis* and MAKMA *E. stellulata*/MAKMC *E. moorei*.

This species differs from the subspecies of *E. pauciflora* as follows:

(1) The mallee habit (*E. pauciflora* ssp. *niphophila* may appear mallee-like in some situations but is usually only a stunted tree, and ssp. *pauciflora* may also have a mallee-like habit as a result of burning).

(2) The juvenile leaves are always narrower.

(3) The habitat is different.

This species is named in honour of the late Edward J. Gregson, of Mt Wilson, whose keen and accurate observations on eucalypts, especially of the Blue Mountains area, were of great value during the 1950's. The senior author owes much to his companionship in the field during those years. The epithet also commemorates E.J. Gregson's father, Jesse Gregson, who collected extensively at Mt Wilson during the early part of this century.

MATELC **Eucalyptus radiata** *Sieber ex DC.* ssp. **robertsonii** (*Blakely*) *L. Johnson et D. Blaxell* **comb. et stat. nov.**

BASIONYM: *Eucalyptus robertsonii* Blakely in J. Roy. Soc. N.S.W. LXI (1927) 167, '*Robertsoni*'.

HOLOTYPE: Talbingo Mountain, near Tumut, New South Wales, C.C. Robertson and W.A.W. de Beuzeville NSW 132542, 9.1924 (NSW) [wrongly cited by Blakely (loc. cit.) as "A.W. Howitt, C.C. Robertson and W.A.W. de Beuzeville"].

DISTRIBUTION: New South Wales: Central Tablelands and Central Western Slopes (northern form of the subspecies), Southern Tablelands and South Western Slopes. Victoria: eastern region north of the Main Divide.

This subspecies is common on the more inland parts of the Tablelands and the adjacent higher parts of the Slopes. In the more northern parts of its range it does not come in contact with the more eastern ssp. *radiata*, but in the Bombala district, for example, there appears to be contact and some intergradation between the two.

In the ranges of the far South Coast of New South Wales and eastern Victoria south of the Main Divide, many of the populations of *E. radiata* display a degree of glaucousness and, at least in this respect, approach ssp. *robertsonii* in aspect. However, they lack the acute operculum of ssp. *robertsonii* and are retained for the present in the rather variable ssp. *radiata*.

Reports of ssp. *robertsonii* from Tasmania (Jackson 1965) refer in fact to a distinct undescribed taxon, MATEHB, related to MATEHA *E. amygdalina*.

MATHAC **Eucalyptus piperita** *Sm.* ssp. **urceolaris** (*Maiden et Blakely*) *L. Johnson et D. Blaxell* **comb. et stat. nov.**

Basionym: *Eucalyptus urceolaris* Maiden et Blakely in Maiden, Crit. Rev. Gen. Euc. VIII (1929) 10, pl. 45, fig. 6.

Holotype: Wingello, New South Wales, J.L. Boorman NSW 132541, 9.1899 (NSW).

Distribution: New South Wales: South Coast, Central and Southern Tablelands, from about Moss Vale to Batemans Bay, mostly on sandy soils.

In general this subspecies tends to occur as quite well-sized trees whereas ssp. *piperita* in many areas is of small to medium stature. Otherwise the difference seems to be confined to fruit-shape. Intermediate forms are found in the contact zone.

MATHDB **Eucalyptus andrewsii** *Maiden* ssp. **campanulata** (*R.T. Baker et H.G. Smith*) *L. Johnson et D. Blaxell* **comb. et stat. nov.**

Basionym: *Eucalyptus campanulata* R.T. Baker et H.G. Smith in J. Roy. Soc. N.S.W. XLV (1911) 288, pl. 13.

Holotype: Tenterfield, N.S.W., C.F. Laseron 12.1909 (Museum of Applied Arts and Sciences, Sydney). Isotype: NSW 132540 (NSW).

Distribution: At intervals from Kroombit Tops south west of Gladstone (south-central Queensland) to the eastern slopes of the Northern Tablelands and North Coast ranges of New South Wales as far south as the southern slopes of Barrington Tops. It forms extensive areas of dry sclerophyll forest, sometimes merging into wet sclerophyll forest.

The range of this subspecies is, in general, to the east of that of ssp. *andrewsii* but the two intergrade in places, e.g. near Wallangarra.

MATKB **Eucalyptus sclerophylla** (*Blakely*) *L. Johnson et D. Blaxell* **stat. nov.**

Basionym: *Eucalyptus haemastoma* Sm. var. *sclerophylla* Blakely, Key Euc. (1934) 218.

Holotype: Mt Victoria, New South Wales, J.H. Maiden NSW 132539, 11.1899 (NSW).

Synonym: *Eucalyptus haemastoma* var. *capitata* Maiden, Crit. Rev. Gen. Euc. I (1908) 319. *Holotype:* Mt Victoria, New South Wales, J.H. Maiden NSW 132538, 4.1889 (NSW).

Distribution: New South Wales: On Triassic and Permian sandstones, and sometimes alluvial sands, of the Central and Southern Coast and Tablelands. It extends from the Howes Valley area to the Jervis Bay and Sassafras districts, and is common on the Blue Mountains.

This taxon is no less distinct than others of Superspecies *Haemastoma*, and is much more widespread than either MATKA *E. haemastoma* or MATKE *E. racemosa* Cav., both of which are confined to the eastern parts of the Central Coast. Blakely's records of these latter species for Jervis Bay, etc., are incorrect.

Although the name *E. haemastoma* var. *capitata* Maiden has priority in varietal rank, we have adopted Blakely's epithet in specific rank, since it is better known and more appropriate.

MAKIM **Eucalyptus paliformis** *L. Johnson et D. Blaxell* **sp. nov.**

Arbor gracilis ad 12 m alta; cortex laevis, olivaceo-bubalinus. Cotyledones reniformes, discolores. Folia adulta lanceolata, non opposita, falcata, 5–11 cm longa, 1–1·5 cm lata. Nervus intramarginalis prominens a margine circa 1 mm remotus; nervi laterales non prominentes, sub angulo circa 30°. Inflorescentiae axillares, saepissime 7-florae, umbelliformes. Alabastra matura circa 7 mm longa, hypanthio campanulato, circa 5 mm longo, operculo plus minusve conico. Fructus globosi, circa 7 mm diametro, valvibus 3 in hypanthio inclusis.

Holotype: SE. of Wadbilliga Trig., Upper Tuross River, New South Wales, L.A.S. Johnson and D.F. Blaxell 490, 4.1971 (NSW).

Isotypes to be sent to K, CANB.

Distribution: This species is known only from the type locality where it forms pure stands in a shallow sandy soil on a ridgetop of quartzitic rock, at an altitude of c. 1200 m. A few plants of MAKKA *E. kybeanensis* and MAKHAA *E. pauciflora* ssp. *pauciflora* occur with the *E. paliformis* community. Stands of MAKIB *E. fraxinoides* abut the stands of the new species, but no intermediates could be found.

Tree to 12 m high, sapling-like in habit. *Bark* smooth, olive-green to beige (occasionally whitish) in colour, shedding in long strips. No rough bark present at the base. *Cotyledons* reniform, green above, purple beneath (typical of the *Strictinae*). *Juvenile leaves* opposite, oblanceolate, sessile, purple beneath. *Intermediate leaves* not opposite, petiolate, lanceolate, discolorous, up to 12 cm long and 4 cm wide; lateral veins at c. 30° to the midrib, intramarginal vein irregular, 1–2 mm from the margin. *Adult leaves* lanceolate, not opposite, concolorous, falcate, 5–11 cm long, 1–1·5 cm wide; lateral veins not prominent, at c. 30° to the midrib; intramarginal vein prominent, c. 1 mm from the margin; petiole flattened dorsiventrally, 0·5–1 cm long. *Inflorescence* axillary, mostly 7-flowered, umbelliform; peduncle terete to slightly flattened. *Mature buds* c. 7 mm long; hypanthium campanulate c. 5 mm long; operculum more or less conical (see note below). *Stamens* cream, all with reniform anthers c. 0·6 mm wide. *Fruits* globular, c. 7 mm in diameter, shortly pedicellate; disc c. 1 mm wide, vertically depressed; staminophore very narrow and, with the operculum scar, forming the rim of the orifice; orifice c. 3 mm diameter. *Valves* 3, deeply enclosed.

Note: The Holotype material includes young buds and open flowers; the dimensions given above are extrapolations from this material.

This species has been named for the "sapling" or "pole-like" appearance of the individuals of the very uniform population. Although the plants within this population appear to be of even age and hence have their "paliform" habit pronounced, the fire-killed parent trees were of a very similar habit.

E. paliformis was not known at the time of publication of Pryor and Johnson (1971) and no coded position was allocated to it. We have accordingly placed it at the end of the *Strictinae* but not within the Superspecies *Stricta*. Unlike the members of the latter, it does not produce lignotubers. It appears to be readily killed by fire, regenerating from seed. In this respect it resembles MAKIA *E. stenostoma*, MAKIB *E. fraxinoides* and MAKIC *E. triflora*.

We wish to thank Mr L. Langley of Robertson, New South Wales, for bringing the existence of this species to our attention.

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Notes on the Plankton of Some Sydney Reservoirs, with Descriptions of Two Interesting Desmids

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SUMMARY

This paper deals with the occurrence of two interesting desmids, viz. *Penium spinulosum* and *Micrasterias nordstedtii* f. *australiensis* in two storage dams belonging to the Sydney water supply. In addition notes as to the composition of the prevailing plankton communities in six storage dams belonging to the Sydney water supply are included together with some taxonomic remarks.

INTRODUCTION

Since Playfair (1908–1920) publications on the freshwater algal flora of Australia have been few and far between. During more recent years desmid collections from the Northern Territory have been described by Scott and Prescott (1958), and from South Australia by Prescott and Scott (1952). There are also some minor notes to be found in various publications, but on the whole, the available information is rather sparse.

In this paper I am discussing two desmids found in plankton samples which were collected by Sydney Water Board biologists from the storage dams constructed for the Sydney water supply. These samples are from six dams, viz. Warragamba, Prospect, Avon, Cordeaux, Woronora and Cataract. All samples were collected by towing a net for 3 minutes behind a boat which was being very slowly rowed. The cone-shaped net was made of No. 20 bolting silk which has 173 meshes to the linear inch, i.e. is rather coarse net. All are composite samples taken from collections made between February and October, 1964. The net was towed in most cases close to the barrages of the respective dams. For physical and chemical data on these dams, see Jolly (1966).

The original samples which have been studied, are housed at present in the Växtbiologiska Institutionen, Uppsala. The duplicate samples are deposited in the National Herbarium of New South Wales, Sydney.

As the samples are qualitative ones, any statements regarding abundance are of little significance. *Melosira granulata* (Ehrenb.) Ralfs, however, proved to be predominant in the composite samples from Warragamba, Cataract and Prospect Reservoirs. The material from Prospect Reservoir has been studied under the Scanning electron microscope by Florin (1970). Among the other frequent plankters are *Peridinium granulosum* Playf. and its relatives which are all characterized by their heavily sculptured plates. In the present samples there are many related taxa all of which are doubtless worthy of further studies, because their taxonomic relationships, in spite of the studies made by Playfair, are not clear in many cases, see Lindemann (1923).

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Notes on two desmids

1. **Penium spinulosum** (*Wolle*) *Gerrath.* Among the plankters occurring in Avon Reservoir a very rare plant was observed. Of course, when discussing the observations of microscopical freshwater algae and their distribution, the problem is often the reliability of the identifications. The plant under consideration has, however, a very characteristic appearance, cf. Fig. 1:2, hence mistakes in identification are unlikely. The plant under consideration is *Penium spinulosum* which was described by Wolle as *Docidium spinulosum*, see Brunel (1949). As was pointed out by Brunel, it is a distinct taxon, and is not closely related to *Pleurotaenium trabecula* var. *hirsutum* (Bail.) Krieger with which it was united by Krieger (1937). I am familiar with *Pleurotaenium trabecula* var. *hirsutum* from Swedish lakes, e.g. Dragen, Jämtland; its hyaline setae do not have the same taxonomic significance as the stout spines in *Penium spinulosum.* Recent electron microscope studies of cell wall ultrastructure by Gerrath (1969) show that the taxon described as *Docidium spinulosum*, and later transferred to the genus *Pleurotaenium*, belongs to the genus *Penium.*

Besides the localities for *Penium spinulosum* in U.S.A. and Canada, there is also a variety which has been described from Madagascar, viz. var. *madagascariense* (Brunel) Gerrath. It ought to be mentioned that only a few specimens have been reported from each of the known localities in U.S.A., Canada, Madagascar, and recently also from Brazil (Thomasson 1966, p. 19 and 1971, p. 13). The Australian discovery fits in well with the pattern of distribution. I have managed to detect only one semicell, see Fig. 1:2, the total length of this plant being about 440μm. This plant which is closely related to the North American specimens, is hardly a plankter, but in spite of this it is of interest to have some idea about the composition of the plankton community where it was noted. The information as to the composition of plankton is given in Table 2.

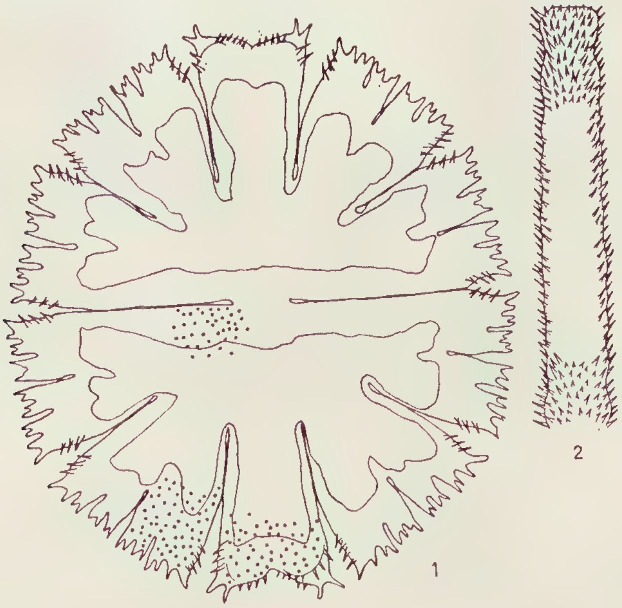

Fig. 1, No. 1. *Micrasterias nordstedtii* f. *australiensis* Thom. — length 290μm, breadth 265μm, Cataract Dam. No. 2. *Penium spinulosum* (Wolle) Gerrath — length 440μm, Avon Dam.

2. **Micrasterias nordstedtii** f. **australiensis** *Thom.* **f. nov.** The second interesting plant is a species of *Micrasterias* occurring in the plankton of Cataract Dam, an area previously studied by Playfair (1913, p. 512). The composite sample is dominated by *Melosira granulata* (Ehrenb.) Ralfs, but without terminal spines, as in specimens from New Zealand (Thomasson 1960, p. 234). Subdominant is *Dinobryon bavaricum* Imhof. For further information as to the composition of plankton in Cataract Dam, see Table 2. The *Micrasterias* under discussion is shown in Fig. 1:1 and Pl. XXXIII:5–6. I have observed about ten specimens of this taxon. The length is about 290µm, and the breadth about 265µm. Notable is the shape of this plant, viz. every group of lateral lobes of order III (originating from lateral lobes of order II) terminates on a line with each other, thus giving the outline a somewhat angular appearance. (For the morphological terms see Krieger 1939, p. 1). There are 3–5 stout spines on the sides of the lobes at the proximal part of the sinuses between the lobes of order II. The wall is porose. This plant resembles *M. papillifera* var. *evoluta* as described by Nordstedt (1888, p. 29, fig. 2:14) from New Zealand. The only essential difference is in the shape and ornamentation of the polar lobes which in the Australian plants resemble those of *M. schweinfurthii* var. *ornata* described by Borge (1918, p. 67, figs. 5:29–30) from Brazil. A somewhat divergent form of the latter has been designated by Förster (1964, p. 382, figs. 20:1–2) as f. *eckertii*. Krieger (1939) has combined *M. papillifera* var. *evoluta* with *M. schweinfurthii* var. *ornata* under *M. sol* var. *evoluta* (Nordst.) Krieger with the reservation that it might be a species in its own right. In my opinion these two taxa should be kept apart. The Brasilian *M. schweinfurthii* var. *ornata* is a distinct taxon characterized by the long rows of spines bordering the incisions of I, II and III orders. The corners of the slender polar lobe usually have three spines. On the whole the var. *ornata* is as little related to *M. schweinfurthii* Cohn as to *M. radiosa* Ralfs (*M. sol* (Ehrenb.) Kütz.). It is better to consider it as a separate species which is not related to *M. papillifera* var. *evoluta*. This plant from New Zealand most probably represents a taxon of higher rank, and not just a variety of *M. papillifera* Bréb. which is a much smaller and less lobed plant. Of course, in the shape of the polar lobe, and in the arrangement of ornamentation they are similar indeed. In spite of this I consider the plant from New Zealand as a separate species, naming it *M. nordstedtii* Thom. nom. nov. The basionym for this taxon is *M. papillifera* var. *evoluta*, as described by Nordstedt (1888, p. 29, fig. 2:14). I have never seen similar plants in my collections from New Zealand, and the degree of variation remains open. Therefore, I consider the related Australian plants as f. *australiensis* Thom.f. nov. of *M. nordstedtii*, differing in the shape and ornamentation of the polar lobes:—

Diagnosis. **Micrasterias nordstedtii** f. **australiensis** *Thom.* **f. nov.** Forma a specie differens quod cellula ambitu fere angulare, quodque forma lobi polaris alia. Membrana densissime porosa. Dimensiones cellularum: longae 290µm, latae 265µm. ICONOTYPUS: figura nostra 1:1. Habitatio: in lacu Cataract dicto, in Australia ad Sydney, raro.

Comments on other phytoplankters

Some of the plants listed in Table 2 require a few comments. As to the *Peridinium*, the plants in Pl. XXXII:1–2 are without any doubt *P. gatunense* var. *zonatum* (Playf.) Lef., described by Playfair as *P. zonatum*. The taxonomic relationships of the plants in Pl. XXXII:3–4 are somewhat doubtful. They are probably identical with one of the plants described by Playfair (1920, p. 814, fig. 42:8) as *P. australe*. That plant originates from the Sydney area, and belongs according to Lindemann (1924, p. 126) to the *bipes* (*tabulatum*) group. Lefèvre (1932, p. 79), however, includes it with *P. volzii* f. *vancouverense* (Wailes) Lef. He has also noticed the presence of an apical pore which makes the arrangement a little doubtful. It ought to be noted that Playfair's *P. australe* includes another plant from Brisbane (fig. 41:4 in Playfair 1920) which belongs to the *willei* (*volzii*) group, and has later been considered by Lefèvre (1932) as belonging to *P. volzii* f. *maeandricum* Lauterb.

Triploceras gracile var. *aculeatum* Nordst. which was described from this part of the world, is a somewhat variable taxon, compare Pl. XXXIII:1–2. In many cases the specimens are rather close to *T. gracile* Bailey but in others they resemble *T. gracile* var. *elegans* (Borge) Krieger (Pl. XXXIII:4), and some other specimens suggest var. *bidentatum* Nordst. (Pl. XXXIII:3). The plants in Pl. XXXIII:1–2 have also some resemblance to var. *undulatum* Scott & Prescott (1958, p. 27, fig. 3:8), and to its f. *septundulatum* Scott & Prescott (1958, p. 28, fig. 22:2). As was pointed out by Nordstedt (1888, p. 65), the taxonomic arrangement of the different forms of *T. gracile* is difficult. It seems to me that one should accept a rather broad conception as to the variation in *T. gracile.* Some of the described varieties and forms are to be included within the variation range of *T. gracile*, and some have to be suppressed in favour of others.

Another taxon described from this area is *Staurastrum longibrachiatum* (Borge) Gutw. This is obviously a taxon showing a broad range of variation. The present population is illustrated by Pl. XXXIV:2–5. The measurements are: length 40–42μm, breadth 80–92μm. The plant in Pl. XXXIV:3 resembles the forma figured in Huber-Pestalozzi (1936, p. 159, fig. 9C) and might be considered as a rather independent forma, having some affinities to *S. leptocladum* group. The plants in Pl. XXXIV:4–5 might be designated as var. *kriegeri* Grönbl., or var. *floridense* Scott & Grönbl., or var. *pseudanchora* Krieger forma in Scott and Prescott (1958, fig. 16:4) which was later transferred by them (1961, figs. 50:6–7) to *S. indentatum* West & West (1902, figs. 22:11–12). The plant in Pl. XXXIV:2 is similar to var. *africanum* Bourr. but has shorter processes. I cannot find any reason for splitting the present population into a number of forms. They all could be interpreted as *S. longibrachiatum* as described by Borge (1896, p. 15, fig. 2:22).

Another taxon which has many forms and varieties is *Staurastrum sexangulare* (Bulnh.) Lund. The plants in the present samples (Pl. XXXIV:1) are more slender than those figured by Lundell. They resemble var. *productum* Nordst. in Scott and Prescott (1961, fig. 46:3) which lacks the truncate apex characteristic of the variety described by Nordstedt (1888, p. 35). The var. *attenuatum* Turner in Scott and Prescott (1961, fig. 46:5) is also similar to the Australian plants. One just wonders whether the two plants figured by Scott and Prescott should, like the plant in Pl. XXXIV:1, be considered as *S. sexangulare* (Bulnh.) Lund.

The forma of *Staurastrum anatinum* Cooke & Wills which has been listed above, is shown in Pl. XXXII:5–6. The length is 32·5–37·5μm, the breadth 64–67·5μm. It is identical with *S. sebaldi* Reinsch in Scott and Prescott (1958, fig. 17:12) who regard it as a small forma of *S. sebaldi.* I have seen similar plants in Gatun Lake, Panama, and in my opinion they belong to the *S. anatinum* group, as *S. sebaldi* is a large and stout plant. Somewhat similar to the plant under discussion is *S. sonthalianum* Turner, e.g. the plant named *S. sebaldi* var. *ventriverrucosum* by Scott and Prescott (1961, fig. 44:5).

Xanthidium hastiferum Turner is shown in Pl. XXXIV:7; length 45μm, with spines 56μm, breadth 45μm, with spines 76μm. It should be compared with *X. hastiferum* in Scott and Prescott (1961, figs. 40:3–4), and *X. hastiferum* var. *javanicum* f. *planum* Turner in Scott and Prescott (1958, figs. 11:2–3), and in Scott and Prescott (1961, fig. 40:5), moreover, see *X. hastiferum* var. *javanicum* f. *angulata* Turner in Huber-Pestalozzi (1936, fig. 8B). Most likely we have here an array of morphological forms.

Staurastrum patens var. *planctonicum* G.S. West (1909, p. 68, fig. 6:14), which has been listed in Table 2, shows that the apical denticulations near each angle and within the lateral margins are transformed in some specimens into small bifurcate verrucae. The processes terminate in two or seldom three spines.

The specimens of *Staurastrum arctiscon* var. *glabrum* West & West are smaller than those described by West and West, being only about 45µm long. As a rule there are six processes in the upper whorl and nine in the lower. However, I have seen specimens which have only three processes in the lower whorl, although Janus-forms also occur. Processes are smooth, and they terminate in two stout spines.

The specimens of *Staurastrum longispinum* var. *depressum* Playf., occurring in Cordeaux Dam, have as a rule two spines at the upper angles. However, there are also Janus-forms in which one of the semicells has only one spine at the upper angles.

The specimens of *Staurastrum platycerum* Josh. from the same sample in Prospect Dam, resemble *S. acanthastrum* West & West, and also *S. sexangulare* var. *subglabrum* West & West figured in Scott & Prescott (1958, fig. 19:1).

Finally, for convenience, some physiographical data about the Sydney Water Supply reservoirs have been summarized in Table 1. For the chemical characteristics of these water bodies, see Williams (1967, p. 56). The zooplankton of these reservoirs has been investigated by Jolly (1966a). Moreover, she has also studied the biological features of Lake Burragorang (1962 and 1966b). The phytoplankton of Prospect Dam has been studied by Cannon (1965), and some additional information as to that reservoir, as well as some of the other reservoirs which are located within the very same area, has been summarized in Table 2. The latter Table gives some idea about the composition of plankton in six of the reservoirs according to the samples placed at my disposal by Mr D. Cannon.

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TABLE 1. *The origin of samples collected by Mr D. Cannon in* 1964

Reservoir	Altitude	Area of stored water	Maximum depth	pH mean	Sample	Dates of collections represented in these samples
	ft a.s.l.	acres	ft			
Burragorang ..	..	18,521	300	7·6	A	4/2, 25/2, 10/3, 28/4, 12/5, 20/10
Prospect ..	196·7	1,266	79	7·0	B	20/1, 3/2, 13/4, 27/4, 25/5, 6/7, 4/8, 28/9
Avon	..	2,506	216	6·4	C	23/1, 19/2, 16/4, 14/5, 30/9
Cordeaux ..	996	1,931	155	6·5	D	19/2, 16/4, 14/5, 3/9, 29/10
Woronora ..	..	937	201	6·0	E	10/2, 11/3, 6/4, 4/5, 27/7, 24/8, 19/10
Cataract ..	950	2,104	150	6·2	F	23/1, 19/2, 11/3, 4/5, 1/6, 19/10

TABLE 2. *The composition of plankton in six Sydney reservoirs*

× — indicates frequent plankter

+ — indicates present

	Burragorang	Prospect	Avon	Cordeaux	Woronora	Cataract	
CYANOPHYTA							
Merismopedia tenuissima	..	..	..	..	+	..	
Microcystis flos-aquae	+	..	..	..	..	..	
Oscillatoria bornetii	+	..	..	..	..	..	
O. limosa	+	..	..	..	..	..	
PYRRHOPHYTA							
Ceratium hirundinella f. gracile	..	..	..	..	..	+	
C. hirundinella f. robustum	×	+	+	..	×	..	
Peridinium australe	..	..	+	..	..	..	
P. bipes	+	..	..	..	..	..	
P. gatunense var. zonatum	+	..	..	..	..	+	Pl. XXXII:1–2
P. granulosum	..	+	+	+	×	..	Playfair 1913, figs. 3c, 3d, 55:3
P. volzii f. maeandricum	+	..	..	+	..	..	
P. volzii f. vancouverense	+	..	..	..	..	+	Pl. XXXII:3–4
CHROMOPHYTA							
Chrysophyceae							
Dinobryon bavaricum	..	..	..	..	+	×	
D. cylindricum	..	..	+	+	+	+	
D. divergens	×	..	+	..	..	..	
D. sertularia	..	..	+	..	..	..	with cysts
Mallomonas fastigiata var. kriegeri	+	..	..	..	..	..	
M. splendens	..	..	+	..	..	..	
Diatomophyceae							
Asterionella formosa	+	..	..	..	..	..	
Cyclotella stelligera	..	+	..	..	..	..	
Melosira granulata	×	×	+	+	+	×	
Rhizosolenia eriensis	+	..	..	..	..	+	
R. eriensis var. morsa	..	..	+	+	+	+	
R. longiseta	..	..	+	..	..	..	
Tabellaria flocculosa f. flocculosa	..	..	..	+	..	+	

TABLE 2 (*continued*)

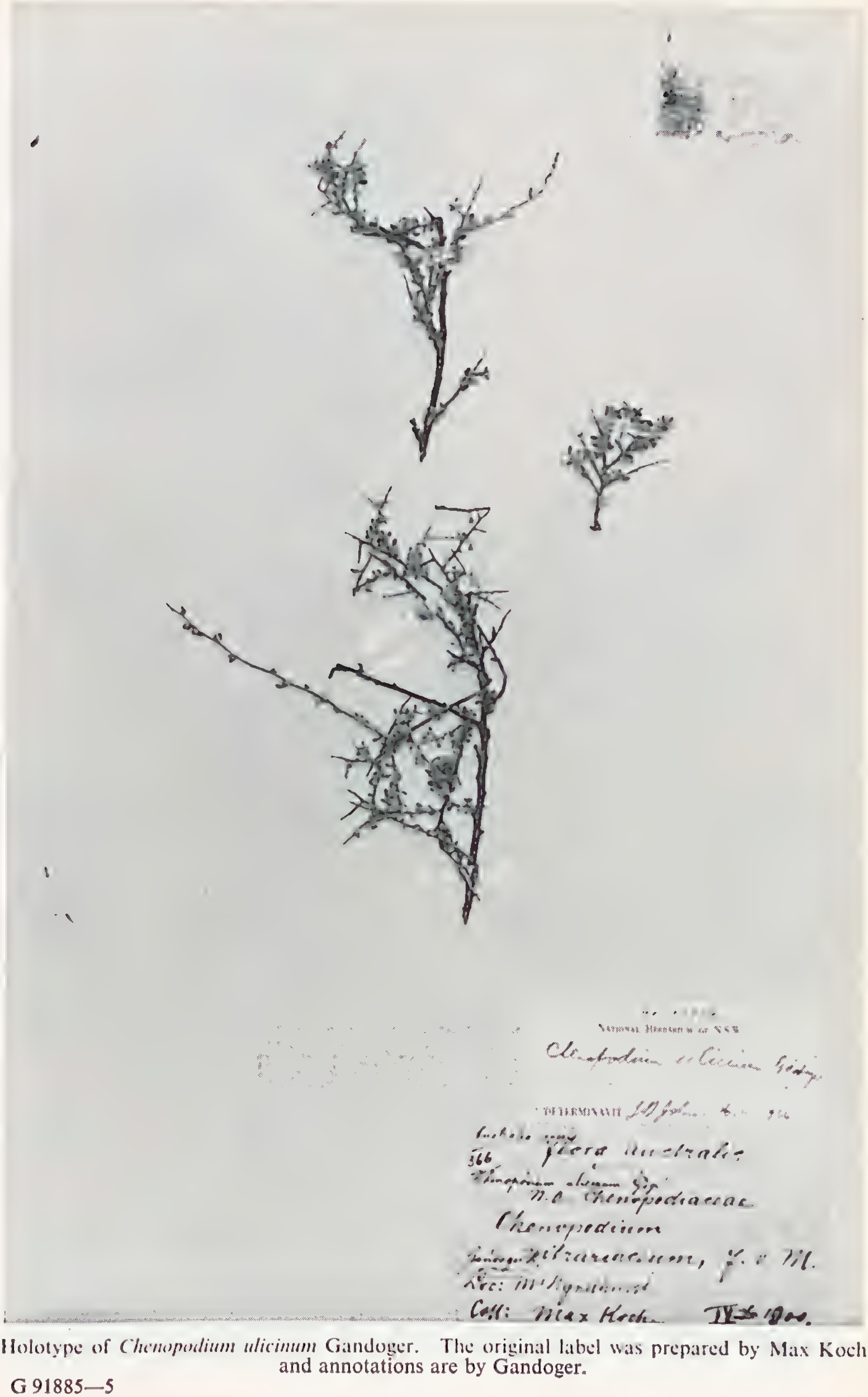
	Burragorang	Prospect	Avon	Cordeaux	Woronora	Cataract
EUGLENOPHYTA						
Phacus orbicularis	..	..	..	+	..	..
Trachelomonas volvocina	+	..	..	..	..	..
CHLOROPHYTA						
Volvocales						
Eudorina elegans	+	..	..	..	..	..
Volvox sp.	+	..	..	..	..	..
Chlorococcales						
Ankistrodesmus falcatus	..	+	..	..	..	..
Botryococcus braunii	..	+	..	..	+	..
B. protuberans	..	+	..	..	..	..
Coelastrum microporum	+	..	..	..	..	..
Dictyosphaerium pulchellum	+	+	..	..	..	..
Dimorphococcus lunatus	..	..	+	..	..	..
Kirchneriella lunaris	..	..	..	..	×	..
K. obesa	..	+	+	..	..	+
Oocystis sp.	+	..	..	..	..	..
Pediastrum boryanum	..	+	..	+	..	..
P. duplex	..	+	..	..	..	..
P. gracillimum	+	+	+	..	..	..
Tetradesmus wisconsinensis	+	..	..	..	..	..
Zygnematales						
Actinotaenium minutissimum	..	..	+	..	..	..
Closterium aciculare	+	..	..	..	..	..
Cl. aciculare var. subpronum	+	..	..	..	..	..
Cl. kuetzingii	..	..	..	+	..	..
Cl. pronum	+	..	..	..	..	..
Cosmarium contractum var. ellipsoideum	..	+	..	..	..	+
C. depressum	..	..	..	×	..	+
C. reniforme	..	..	+	..	..	..
C. tortum f. trigona	..	+	..	..	..	..
Desmidium swartzii	..	+	+	+	..	..

TABLE 2 (*continued*)

	Burragorang	Prospect	Avon	Cordeaux	Woronora	Cataract	
Hyalotheca dissiliens	..	+	+	+	..	+	
Micrasterias nordstedtii f. australiensis	..	..	..	..	..	+	Fig. 1:1, Pl. XXXIII:5–6
Penium spinulosum	..	..	+	..	..	..	Fig. 1:2
Spondylosium panduriforme	..	+	..	..	..	..	
Staurastrum anatinum var. simplicium	+	..	..	..	..	..	
St. anatinum forma	..	..	..	+	..	+	Pl. XXXII:5–6, cf. Scott & Prescott 1958, fig. 17:12
St. arctiscon var. glabrum	..	+	+	+	..	..	
St. bicorne	..	+	..	..	..	..	
St. emaciatum	..	..	+	..	..	..	length 28µm
St. johnsonii var. altior	..	..	+	..	..	..	
St. laeve	..	..	..	+	..	..	
St. laevispinum var. subbrachiatum	..	..	+	..	..	+	length 12·5 (30) µm
St. leptocladum var. elegans	+	..	..	..	..	..	cf. Thomasson, 1960, fig. 22
St. longibrachiatum	..	..	..	..	..	+	Pl. XXXIV:2–5
St. longispinum var. depressum	..	..	..	+	..	..	length 57µm
St. luetkemuelleri	+	+	..	..	..	..	
St. manfeldtii	..	..	+	..	..	..	
St. muticum	..	+	..	..	..	..	
St. ophiura var. horizontale	..	+	..	..	..	..	
St. patens var. planctonicum	..	+	+	+	..	..	
St. pingue	+	..	..	..	..	..	
St. pingue forma	+	..	..	..	..	..	cf. Thomasson 1960, p. 235
St. planctonicum var. bullosum	+	..	..	..	..	..	
St. platycerum	..	+	..	+	..	..	
St. sagittarium	..	+	+	+	+	+	Pl. XXXII:7–8, Pl. XXXIV:6
St. sexangulare	..	+	+	+	+	+	Pl. XXXIV:1
St. smithii	..	+	+	+	+	+	
St. subgrande	..	+	..	..	..	..	
St. tetracerum	..	..	..	+	+	..	
St. tohopekaligense	..	..	+	+	..	+	

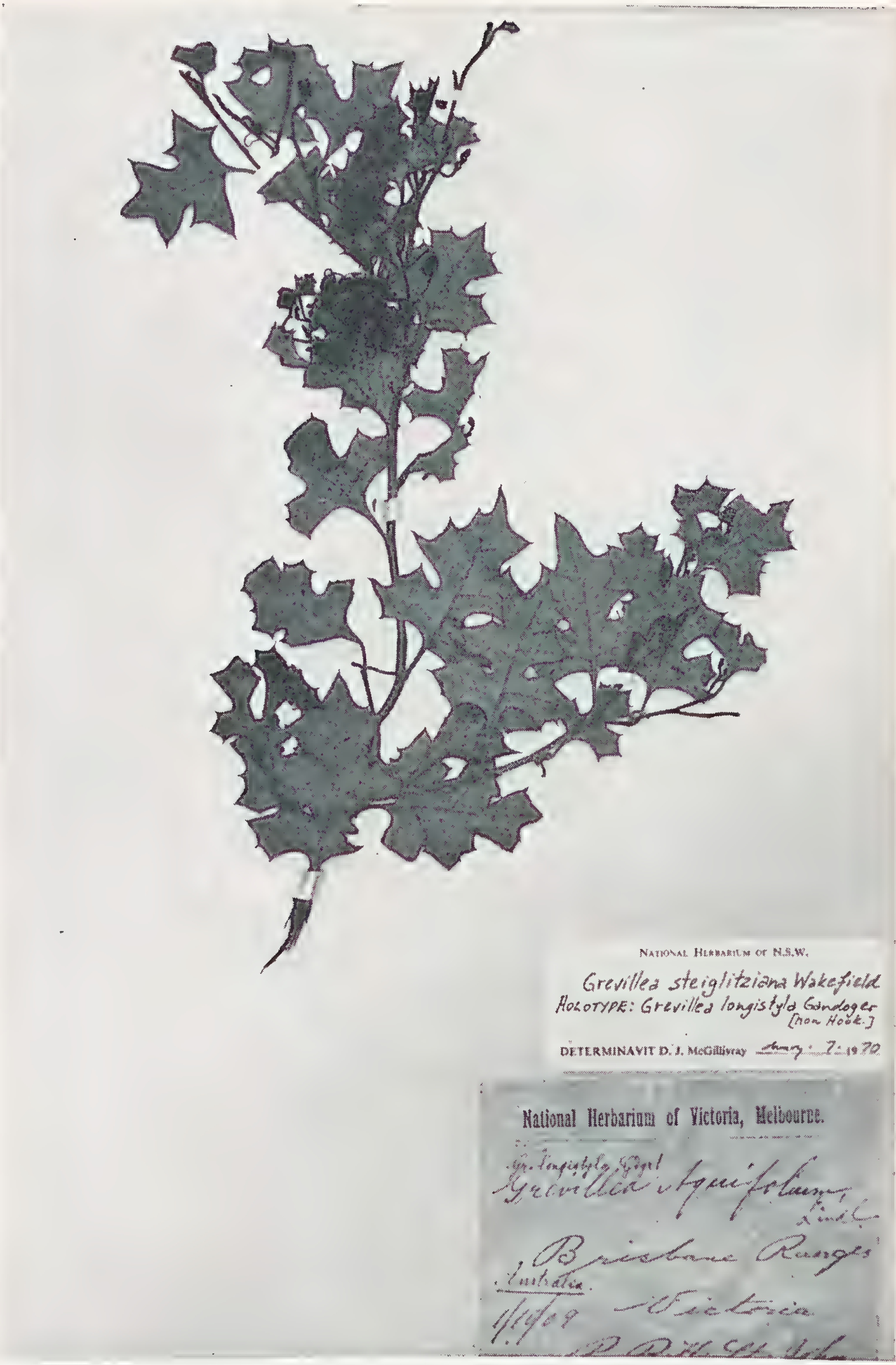
TABLE 2 (*continued*)

	Burragorang	Prospect	Avon	Cordeaux	Woronora	Cataract	
St. tohopekaligense var. brevispinum	..	+	+	..	..	..	
Staurastrum sp.	..	..	..	+	..	..	Playfair 1913, fig. 54:26
Staurodesmus cuspidatus	..	+	..	..	..	..	
Std. dejectus var. apiculatus	..	..	+	..	..	..	
Std. triangularis	..	+	+	..	..	..	
Std. triangularis var. limneticus	..	..	+	..	+	+	
Triploceras gracile var. aculeatum	..	+	+	+	+	+	Pl. XXXIII:1–4
Xanthidium fasciculatum forma	..	..	..	..	..	+	
X. hastiferum	..	..	..	+	..	+	Pl. XXXIV:7
X. octonarium var. cornutum	..	..	..	..	..	+	Pl. XXXIII:7–9
ROTATORIA							
Ascomorpha ovalis	+	..	+	+	+	+	
A. saltans	..	..	..	+	..	..	
Asplancha sp.	+	..	..	..	..	..	
Brachionus caudatus	..	..	+	..	..	..	
Collotheca sp.	..	+	..	..	..	..	
Conochiloides natans	..	..	+	..	+	..	
Filina terminalis	..	..	..	+	..	..	
Hexarthra sp.	+	..	..	..	..	..	
Keratella cochlearis	+	..	+	+	×	+	
Lecane bulla	..	+	..	..	..	..	
L. lunaris	..	..	..	..	..	+	
Polyarthra vulgaris	..	..	..	+	+	+	
Synchaeta sp.	+	..	..	..	..	..	
Trichocerca chattoni	+	..	..	..	..	..	
T. porcellus	..	+	..	..	..	..	
CLADOCERA							
Bosmina meridionalis	+	..	+	..	+	..	
Daphnia lumholtzi	+	..	..	..	..	..	



Holotype of *Chenopodium ulicinum* Gandoger. The original label was prepared by Max Koch and annotations are by Gandoger.

Plate XXIX



NATIONAL HERBARIUM OF N.S.W.

Grevillea steiglitziana Wakefield
HOLOTYPE: Grevillea longistyla Gandoger
[non Hook.]

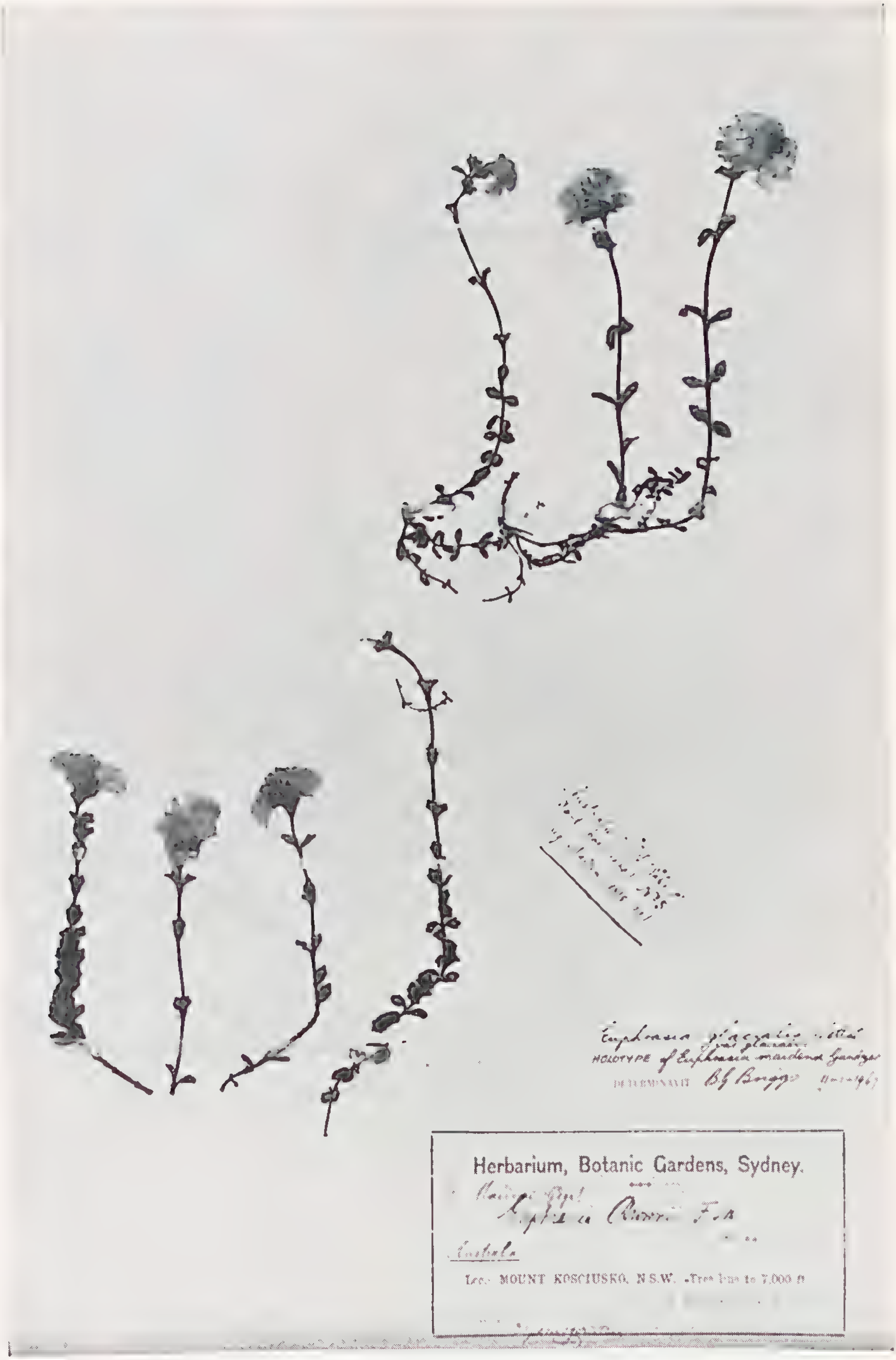
DETERMINAVIT D. J. McGillivray Aug. 7. 1970

National Herbarium of Victoria, Melbourne.

Gr. longistyla Gdgr!
Grevillea aquifolium
Lindl.
Brisbane Ranges
Australia
1/11/09 Victoria
[illegible]

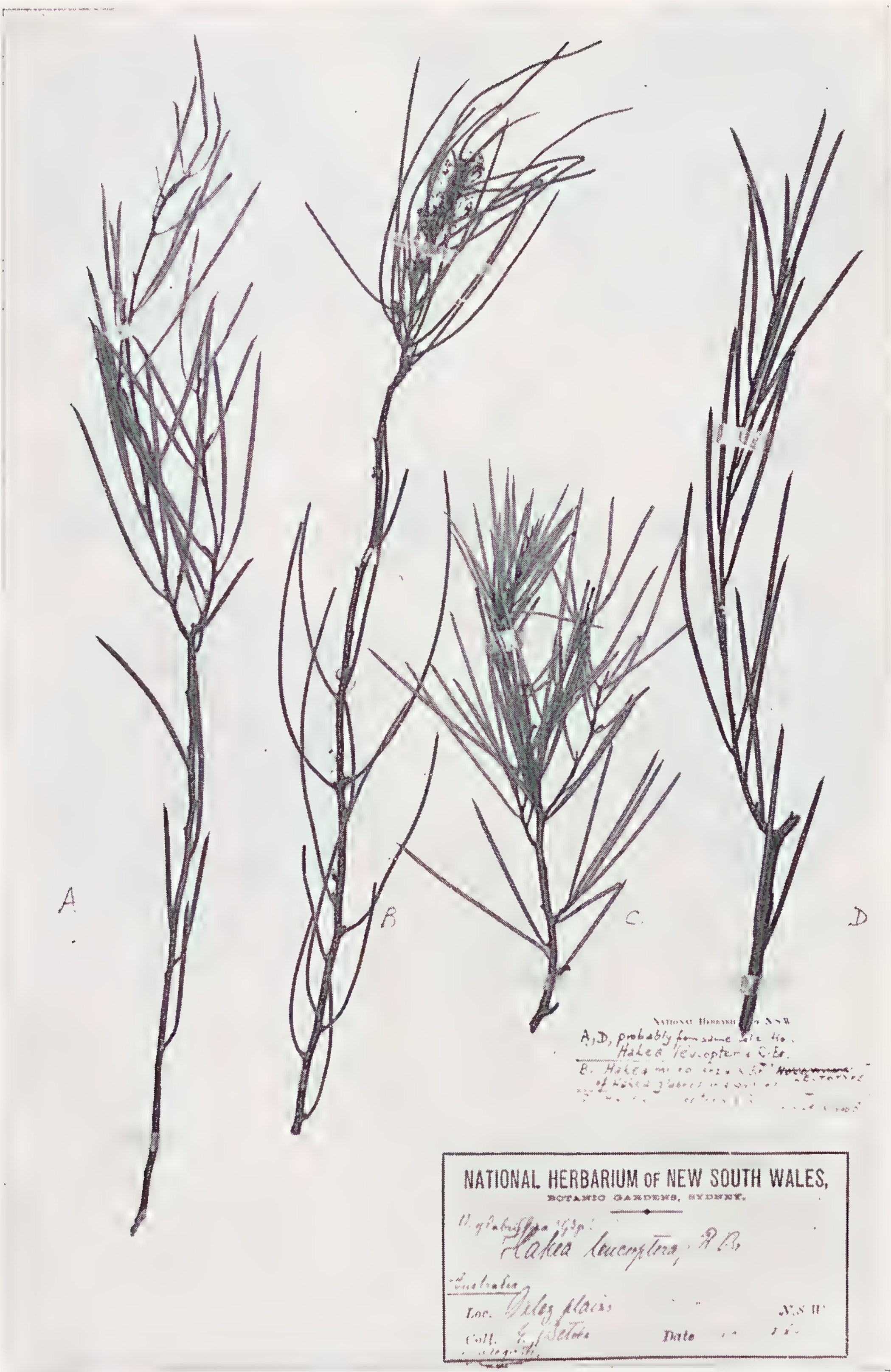
Grevillea steiglitziana N.A. Wakefield; holotype of *Grevillea longistyla* Gandoger [non Hook.].

Plate XXX


HOLOTYPE of Euphrasia maidenii Gandoger
DETERMINAVIT B.G. Briggs
Herbarium, Botanic Gardens, Sydney.
Loc.: MOUNT KOSCIUSKO, N.S.W.

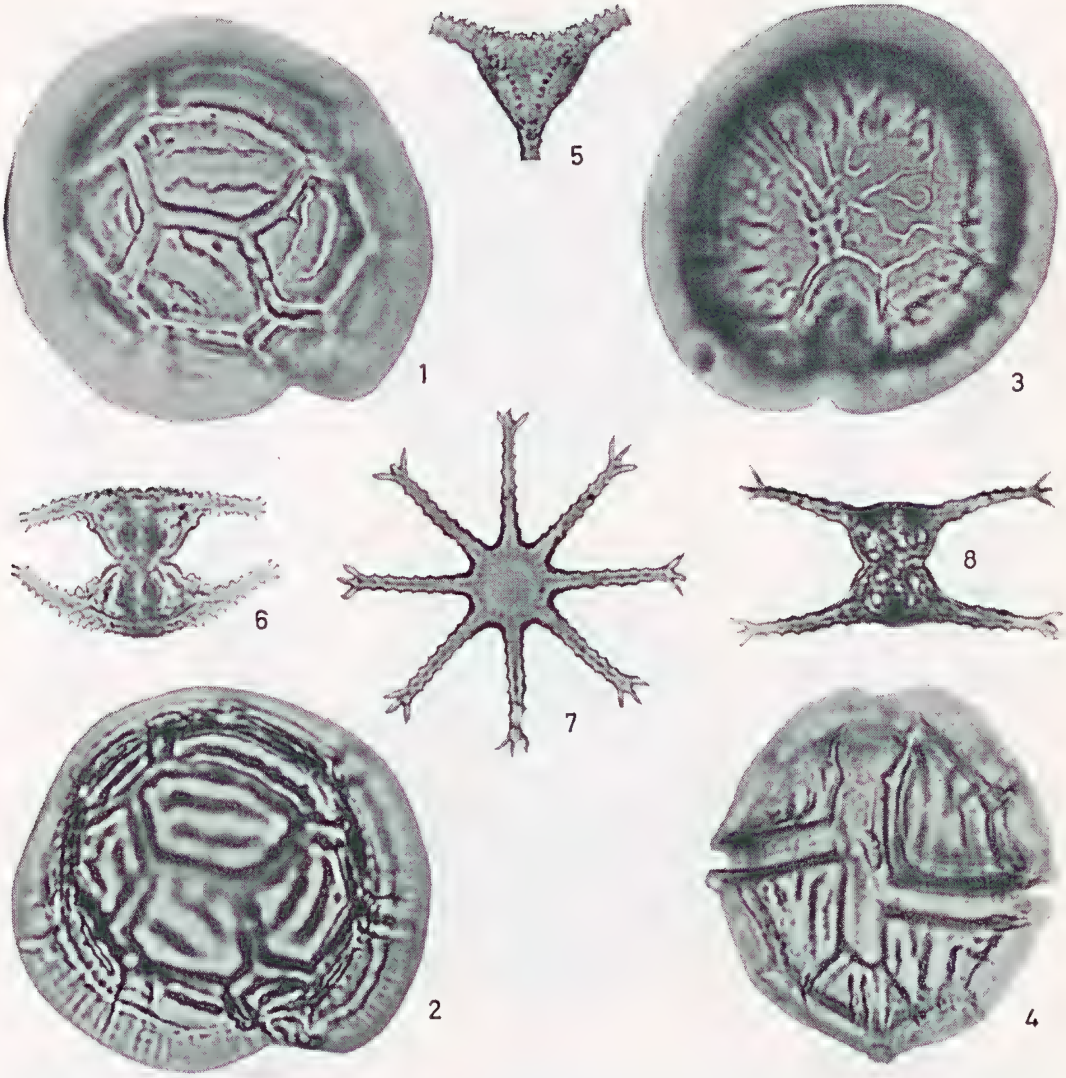
Euphrasia glacialis Wettst. var. *glacialis;* holotype of *Euphrasia maidenii* Gandoger.

Plate XXXI



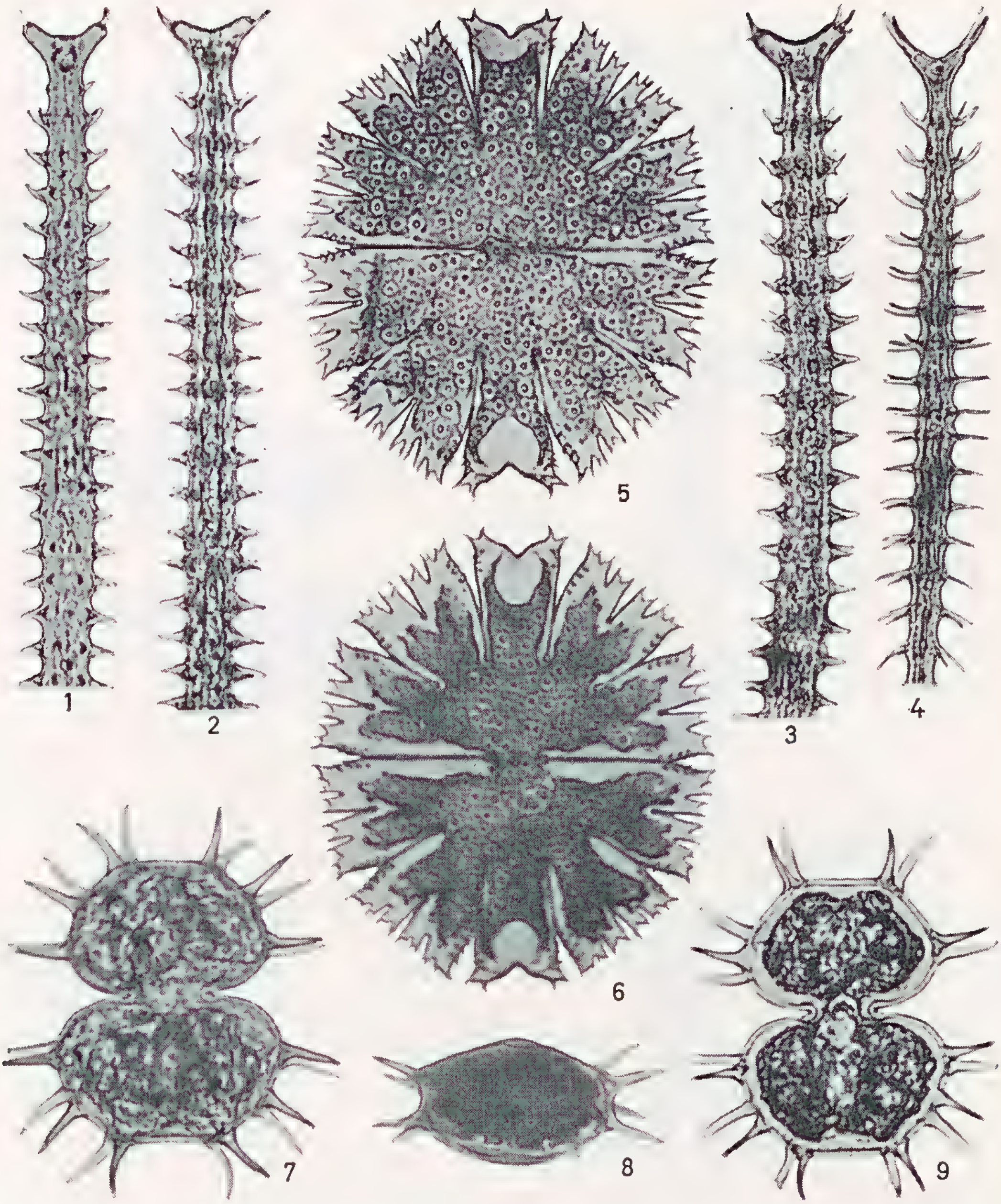
Hakea microcarpa R. Br. and *Hakea leucoptera* R. Br., including the lectotype of *Hakea glabriflora* Gandoger. The original data on the label was written by E. Betche.

Plate XXXII

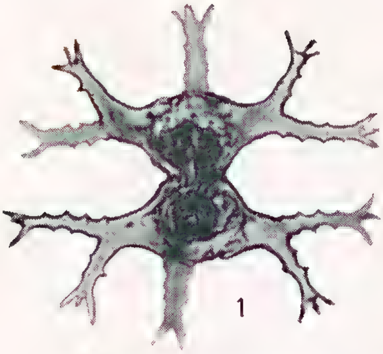


1–2. *Peridinium gatunense* var. *zonatum* (Playf.) Lef. — Cataract Dam. 3–4. *P. volzii* f. *vancouverense* (Wailes) Lef. (?) — Cataract Dam. 5–6. *Staurastrum anatinum* Cooke & Wills forma — length 32.5–37.5µm, breadth 64–67.5µm, Cataract Dam. 7–8. *S. sagittarium* Nordt. — Cataract Dam.

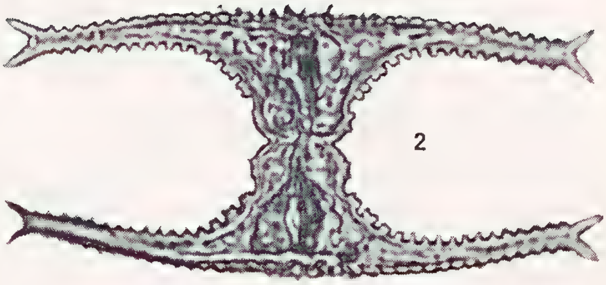
Plate XXXIII



1–4. *Triploceras gracile* var. *aculeatum* Nordst. — Cataract Dam. 5–6. *Micrasterias nordstedtii* f. *australiensis* Thom. — length 290μm, breadth 265μm, Cataract Dam. 7–9. *Xanthidium octonarium* var. *cornutum* Playf. — length 72 (100)μm, breadth 56 (88)μm, Cataract Dam.



1



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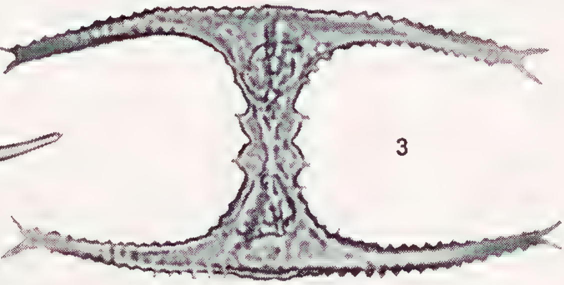

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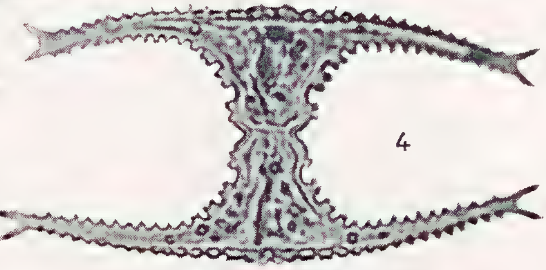

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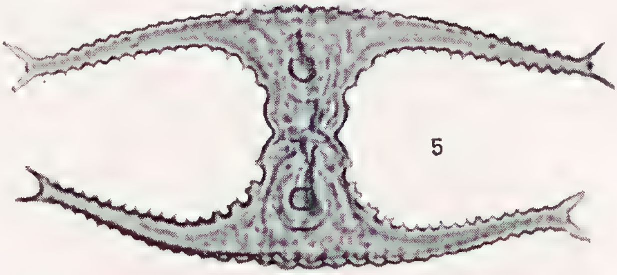

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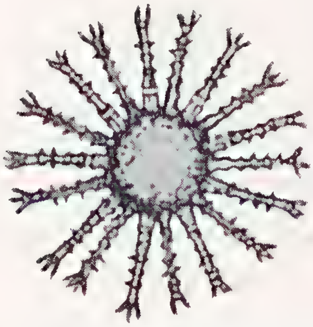
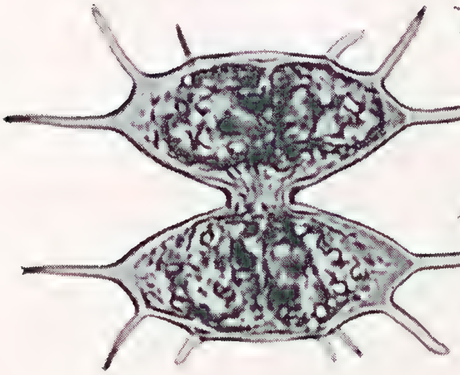


6



7

1. *Staurastrum sexangulare* (Bulnh.) Lund. — Cataract Dam. 2–5. *S. longibrachiatum* (Borge) Gutw. — length 40–42µm, breadth 80–92µm, Cataract Dam. 6. *S. sagittarium* f. *evolutum* Grönbl. & Scott — Avon Dam. 7. *Xanthidium hastiferum* Turner — length 45 (56)µm, Cataract Dam.

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New Species and Lectotypification in Australian *Plantago*

Barbara G. Briggs, R.C. Carolin* and Jean M. Pulley†

SUMMARY

Descriptions are given for five new species of *Plantago*: *P. glacialis*, *P. alpestris* and *P. euryphylla* (Sect. *Oliganthos*), *P. turrifera* (Sect. *Mesembrynia*) and *P. cladarophylla* (tentatively referred to Sect. *Mesembrynia*). Lectotypes are designated for five specific or infraspecific names.

The taxa described in this paper will be treated more fully in the account of the Plantaginaceae to be published in the Flora of New South Wales, No. 181. Amplified descriptions, citations of specimens, and some comments on affinities are included in the Flora treatment.

SECTION OLIGANTHOS

Plantago glacialis *Briggs, Carolin et Pulley*, **sp. nov.**

Herbae perennes radicibus adventitiis caulorrhiza saepe ramosissima. Folia lineari-elliptica vel oblanceolata, (1)–2–4–(7) cm longa, 1–5 mm lata, crassa nitida glabra vel pilibus paucis (rare multis) praesertim marginem versus, ad basin sensim angustata caespite axillari pilorum brunnescentium. Scapi glabri folia plus minusve aequantes capitulo (1)–2–3–(5) florum instructi. Sepala elliptica carina angusta. Ovarium biloculare ovulis 2 in quoque loculo. Capsula ellipsoidea 1·5–2 mm diam. Semina elliptica 1·2–1·8 mm longa hilo superficiali.

Holotype: SE. slope of Muellers Peak, Kosciusko area, N.S.W., alt. 2010 m, c. 36° 26′ S 148° 16′ E, B.G. Briggs No. 4033 & R. Carolin 18.2.1971 (NSW) upper left specimen on sheet.

Distribution: Kosciusko plateau (Southern Tablelands of New South Wales) and Bogong High Plains (Eastern Highlands of Victoria). In cold seepage areas below snow patches, mostly above 2000 m alt.

Plantago alpestris *Briggs, Carolin et Pulley*, **sp. nov.**

Herbae perennes radicibus adventitiis. Folia pubescentes, superficie nitidula texto satina simili, oblanceolato-elliptica vel obovata, (2)–6–8 cm longa, (0·7)–1–2–(2·5) cm lata, in petiolum plerumque latum sensim angustata et in rosula disposita. Scapi 8–16 cm longi tempore florendi. Spicae ovoideae vel cylindraceae. Bracteae concavae ovatae 2–2·5 mm longae carina obtusata. Sepala subaequalia elliptica. Ovarium biloculare ovulis 2 in quoque loculo. Capsula ovoidea 2·3–2·5 mm diam. Semina 2 in quoque loculo, elliptica hilo superficiali.

Holotype: Col between Mt Lee and Mt Northcote, Kosciusko plateau, N.S.W., 2010 m alt., c. 36° 25′ S 148° 17′ E, B.G. Briggs No. 4031 and R. Carolin 18.2.1971 (NSW). Isotype: SYD.

Distribution: Kosciusko plateau and Mt Jagungal (Southern Tablelands of New South Wales) and Mt Baw Baw (Victoria). In moist sites in the alpine and subalpine zones.

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* John Ray Herbarium, University of Sydney.
† Canberra Botanic Gardens.

Plantago euryphylla *Briggs, Carolin et Pulley*, **sp. nov.**

(Greek: eurys = broad, phyllon = leaf)

Herbae perennes radicibus adventitiis. Folia obovata vel spathulata, 3–10·5 cm longa, 13–38 mm lata, ad basin sensim angustata et in rosula disposita caespite axillari conspicuo pilorum brunnescentium. Scapi pubescentes (6)–10–20–(30) cm longi, c. 1·5 mm diam., spica anguste cylindracea 4–8–(11) cm longa instructi. Sepala elliptica 1·5–2·5 mm longa glabra ± carinata. Ovarium biloculare ovulis 2 in quoque loculo. Capsula late ovoidea 2 mm longa 1·5–2 mm lata. Semina 2 in quoque loculo elliptica 1·2–1·8 mm longa hilo superficiali.

HOLOTYPE: 1 km SW. of Blue Lake, Kosciusko Plateau, 6·5 km NE. of Kosciusko summit, N.S.W., 1920 m alt., c. 36° 25′ S 148° 18′ E, B.G. Briggs No. 4002 & R.C. Carolin 17.2.1971 (NSW).

DISTRIBUTION: Southern Tablelands of New South Wales from the Brindabella Range to the Kosciusko plateau and in the Eastern Highlands of Victoria. In alpine herbfield and subalpine grassland.

SECTION MESEMBRYNIA*

Plantago cladarophylla *Briggs, Carolin et Pulley*, **sp. nov.**

(Greek: kladaros = easily broken, frail; phyllon = leaf)

Herbae perennes radicibus adventitiis et radice primaria saepe persistenti. Folia angusto-elliptica usque elliptica, (3·5)–7–26 cm longa, 8–22 mm lata, glabrescentia vel sparse pubescentia, in vivo fragilia, ad basin sensim angustata, caespite axillari pilorum argenteo-brunnescentium. Scapi sparse pubescentes spica angusta cylindrica (3)–10–13 cm longa instructi. Sepala elliptica 1·8–2 mm longa carina glabra angusta. Ovarium biloculare, loculo altero ovula 2 altero ovula 3 continenti, quorum superius ab inferioribus duobus tumore placentae divisum est. Capsula ovoidea 4–5 mm longa. Semina plerumque elliptica 2 mm longa biconvexa hilo superficiali.

HOLOTYPE: Barrington Tops, N.S.W., in Polblue Creek, amongst rocks in creek, 4900 ft [1470 m], J. Pulley No. 686 and I. Telford 10.11.1971 (NSW). ISOTYPES: CBG 039124, MEL, CANB, BRI, UNE, AD, ADW, NT, SYD, K.

DISTRIBUTION: Southern end of the Northern Tablelands, New South Wales, on Barrington Tops and Gloucester Tops plateaus. In moist habitats mostly c. 1500 m alt.

Plantago turrifera *Briggs, Carolin et Pulley*, **sp. nov.**

(Latin: turris = a tower, fero = I bear, referring to the capsule)

Herbae annuae radice primaria persistenti. Folia rosulata pubescentia anguste elliptica dentata. Scapi (2)–4–12 cm alti pubescentes. Spicae plerumque fulvae non nitidae. Sepala carina lata fulva hebetata. Capsula rostro longiusculo cylindraceo quadrilobato coronata. Semina 5 eorum uno in rostro contento.

HOLOTYPE: 10 miles (16 km) NE. of Byrock, N.S.W., J. Thompson NSW 124895, 8.9.1969 (NSW, upper left specimen on sheet).

DISTRIBUTION: Temporarily moist sites in semi-arid regions: southwestern Queensland; in New South Wales on the Central Western Slopes, Western Plains and eastern edge of the Far Western Plains; northwestern Victoria; eastern South Australia (near Loveday); and inland Western Australia (near Laverton and Norseman).

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* We consider that some revision is needed of the Sections of *Plantago* recognized by Pilger in Engler, Pflanzenr. 269, Heft 102 (1937) and now widely adopted. *P. cladarophylla* is placed in this Section on account of its fruit characters, but it shows considerable similarity to some species referred to Sect. *Oliganthos*.

LECTOTYPIFICATION

P. muelleri *Pilger* In Engler, Pflanzenr. 269. Heft 102 (1937) 118.

Lectotype: Sources of the Murray River, Dr F. v. [Mueller] (MEL 1432, originally labelled *P. stellaris α latifolia*).

The name *P. muelleri* was proposed by Pilger as a legitimate name for *P. stellaris* F. Muell. non Salisb. Mueller's citation "In irriguis glareosis alpinum Australiae prope originem fluviorum Murray et Snowy" applies to specimens of two species, mounted in MEL on different sheets: (i) Sources of the Murray River, labelled as *P. stellaris α latifolia* (MEL 1432); (ii) Sources of the Snowy River, labelled as *P. stellaris β. angustifolia* (MEL 1431). Mueller's description is equally appropriate to either sheet but by implication he restricted the name to the larger plants (such as the lectotype) in Fragm. Phytogr. Austral. VIII (1874) 148, where he referred the smaller plants to *P. gunnii* Hook. f. Moreover, Pilger's characterization of *P. muelleri* clearly applies to the species represented on MEL 1432. MEL 1431 belongs to the species here described as *P. glacialis.*

Specimens in K include Isolectotype material and specimens of *P. glacialis*, originally labelled similarly to MEL 1432 and MEL 1431 respectively.

P. debilis *R. Br.*, Prodr. (1810) 425.

Lectotype: Hawkesbury & N [?] Brush, *R. Brown* 1802–3 (BM). Syntype: Port Jackson, R. Brown (BM). The lectotype is the only sheet in BM labelled by Brown as *Plantago debilis*, and was examined for us by L.A.S. Johnson.

P. hispida *R. Br.*, Prodr. (1810) 425.

Lectotype: Ad littor. arenos: ma. . . [?] Port Dalrymple [Tasmania], *R. Brown* [1803–4] (BM), uppermost specimen on sheet, labelled by Brown as *Plantago hispida.* The two specimens mounted immediately below may possibly be part of the same collection. The sheet also bears Syntype specimens of *P. hispida* collected by Brown at the Derwent River, Tasmania, and originally labelled as "*Plantago scabra*". In the protologue of *P. hispida*, Brown cited southern Australia ("M") as well as Tasmania ("D") but there are apparently no Brown collections of *P. hispida* from the former area in BM or K. There is a Brown collection of *P. varia* (a syntype of that species) from Port Phillip (in BM), but this was labelled "*Plantago polymorpha* var. *glabriuscula*", "*P. polymorpha*" being Brown's original manuscript designation for *P. varia.* These specimens in K and BM were examined for us by L. Pedley and L.A.S. Johnson.

P. varia *R. Br.*, Prodr. (1810) 425.

Lectotype: prope fl. Derwent [Tasmania], *R. Brown* Mai 1804 (BM), upper left specimen on sheet, originally labelled "*Plantago polymorpha*". The sheet also bears Syntype collections by Brown from Port Phillip (top right label, 2 plants, originally labelled "*Plantago polymorpha* var. *glabriuscula*") and from "Cataract River, Port Dalrymple" (lower label, 2 plants, originally labelled *Plantago petiolaris*, an unpublished name).

Of Brown's collections only the proposed lectotype and the Cataract River specimens agree well with his description of *P. varia.* The Port Phillip and Port Jackson specimens have almost glabrous leaves and are not suitable since Brown emphasised the pubescence; these specimens are indeed referable to *P. gaudichaudii* Barnéoud (1845). The original naming of the specimens suggests that the Derwent River specimen may exemplify Brown's concept of *P. varia* more appropriately than the Cataract River collection.

P. varia *R. Br.* f. **glabra** *Pilger* in Pflanzenr. 269, Heft 102 (1937): 269.

Isolectotype: [Botany Bay] New Holland, Banks & Solander [NSW 121559] 1770 (BM, NSW). Both the original of the Lectotype and the other Syntype (South Australia, Plantae Muellerianae) were previously in B and are no longer extant.

This name is considered to be a synonym of *P. hispida* R. Br.

ACKNOWLEDGEMENTS

Thanks are due to Mr L. Pedley (Queensland Herbarium), Mr J. Carrick (State Herbarium of South Australia), and Dr L.A.S. Johnson who examined Type specimens for us in overseas herbaria, to Mrs R. Nielsen who gave technical assistance, and to the Directors of various Australian and overseas herbaria who made specimens available to us for study. For all their assistance we are most grateful.

Chromosomal Studies on *Plantago* in Australia

BARBARA G. BRIGGS

SUMMARY

Chromosome numbers have been determined for 15 native and 4 naturalized species. The Australian species are all based on $x = 6$ and have been referred to three Sections of *Plantago:* Sect. *Palaeopsyllium* (*P. hedleyi*, tetraploid, Lord Howe Island), Sect. *Oliganthos* (4 diploids, 1 tetraploid, 1 hexaploid) and Sect. *Mesembrynia* (6 diploids, 1 tetraploid, 1 hexaploid). All show similar karyotypes, with a satellited chromosome and the longest chromosome both similar in length and arm-ratio in all species studied in detail.

CHROMOSOME NUMBERS

There have been several surveys of chromosome numbers in *Plantago* (e.g. McCullagh 1934; Rahn 1957; Bassett 1966, 1967a, 1967b; Groves and Hair 1971), while detailed comparisons of karyotypes in allied species have been made by Stebbins and Day (1967) and by Cartier (1971).

The base number $x = 6$ occurs in the majority of species counted and is represented in most of the Sections recognized by Pilger (1937). Other numbers represented are $x = 5$, as found in several groups particularly of Sect. *Leucopsyllium* and Sect. *Coronopus*, and $x = 4$, which is reported in a few species. Polyploidy is fairly common but the primary diversification within the genus has apparently not been accompanied by change of either base number or level of ploidy.

TABLE I. CHROMOSOME NUMBER DETERMINATIONS

Localities of collection are in New South Wales except where indicated. Voucher specimens are placed in NSW unless another herbarium is indicated.

Section Species	Locality	$2n$	No. plants counted	Voucher
Sect. *Coronopus*				
coronopus L. ssp. *coronopus**	N. of Dalveen, Q.	10	1	Briggs 4220.
Sect. *Plantago*				
major L.*	Wollstonecraft	12	2	Briggs 4481.
Sect. *Novorbis*				
hirtella Kunth*	Croydon Park	24	1	Gray NSW 121620.
Sect. *Arnoglossum*				
lanceolata L.*	S. of Eureka	12	1	Coveny 4367.
	NE. of Gunning	12	1	Briggs 4501.
	Tumblong	12	2	Briggs 4505.
	Windy Pt., S.A.	12	1	Briggs 4665.
Sect. *Palaeopsyllium*				
hedleyi Maiden	Goathouse, Lord Howe I.	24	1	Rodd 1827.
Sect. *Oliganthos*				
glacialis Briggs, Carolin et Pulley†	Hedley Tarn, Kosciusko	12	1	Briggs 4014 & Carolin.
	Kosciusko summit	12	4	Briggs 4532.
muelleri Pilger	Betts Crk., Kosciusko	36	1	Briggs 4371.
	Snowy R., 1620 m Kosciusko	36	1	Briggs 4011.
	Kosciusko summit	36	1	Briggs 4533.

TABLE I—*continued*

Section Species	Locality	2*n*	No. plants counted	Voucher
palustris Fraser et Vickery†	Polblue Crk., Barrington Tops	24	1	Pulley 683 (CBG).
alpestris Briggs, Carolin et Pulley	L. Cootapatamba, Kosciusko	12	1	Briggs 4034 & Carolin.
	Kosciusko summit	12	2	Briggs 4531.
euryphylla Briggs, Carolin et Pulley	Daners Gap, Kosciusko	12	2	Briggs 4368, 4534.
	Betts Camp, Kosciusko	12	1	Briggs 4370.
	Muellers Peak, Kosciusko	12	1	Briggs 4029 & Carolin.
Sect. *Mesembrynia*				
cladarophylla Briggs, Carolin et Pulley	Polblue Crk., Barrington Tops	36	1	Pulley 686 & Telford.
antarctica Decne.	Mt Gingera, A.C.T.	12	1	Pulley 756.
	Naas Crk., A.C.T.	12	4	Briggs 4523, 4524, 4528 (2 plants).
	Kiandra	12	4	Briggs 4377.
	SE. of Kiandra	12	4	Briggs 4375.
	nr. Cabramurra	12	1	Briggs 4379.
	SW. of Cobungra, V.	12	2	Briggs 4411.
debilis R. Br.†	NE. of Glen Innes	12	1	Briggs 4204.
	Kyogle	12	4	Coveny 4856.
	Garie Beach	12	1	Briggs 4059 & Carolin.
hispida R. Br.†	Narrabeen	12	1	Briggs 4066 & Carolin.
	Garie Beach	12	2	Briggs 4058, 4058a.
	nr. Shellharbour	12	1	Briggs 4056.
	Kiama	12	2	Briggs 4054.
varia R. Br.‡	Orange	24	3	Coveny 4155.
	Naas Crk., A.C.T. (± glabrous plants)	24	4	Briggs 4526, Carolin & Pulley.
	Culcairn	24	1	Flynn NSW 122082.
gaudichaudii Barn.	Applethorpe, Q.	24	4	Briggs 4221.
	nr. Amosfield	24	1	Briggs 4238a.
	nr. Amosfield	36	1	Briggs 4238b.
	Mt Kaputar	12	5	Briggs 4295.
	Liverpool	12	1	Briggs 4068.
	Huskisson	24	3	Briggs 4466.
	NW. of Braidwood	24	3	Briggs 4363 & Johnson.
	Tharwa, A.C.T.	12	1	Briggs 4499, Carolin & Pulley.
	S. of Culcairn	24	5	Flynn NSW 69608.
gaudichaudii–varia intergrade	Coromandel Valley, S.A.	24	4	Briggs 4666.
turrifera Briggs, Carolin et Pulley	NW. of Nyngan	12	1	Thompson NSW 124896.
cunninghamii Decne.	Brewarrina	12	2	Johnson 7528.
	W. of Wee Waa	12	2	Briggs 4323.
drummondii Decne.†	SW. of Nappa Merrie, Q.	12	1	Carrick 1903 (AD).
	Innamincka, S.A.	12	1	Briggs 4634.
	S. of Tingatingana, S.A.	12	1	Carrick 1974 (AD).
	Strzelecki Crk., S. of Innamincka S.A.	12	1	Carrick 1866 (AD).
	E. of Murnpeowie, S.A.	12	1	Whibley 2338 (AD).
	S. of Moolawatana, S.A.	12	1	Whibley 2541 (AD).

* Naturalized species; chromosome number agrees with reports from non-Australian sources.

† Results in agreement with chromosome count on this species by Carolin (unpublished).

‡ Curtis (1967) reports both diploids and tetraploids in *P. varia* in Tasmania.

The present findings (Table I) show $x = 6$ in all Australian native species counted. One species, *P. gaudichaudii*, includes both polyploids and diploids but for other species the same chromosome number occurred in all plants studied, despite the presence of occasional polyploid cells in the roots of many plants. Counts on introduced species agree with previous reports on these species, or agree with the condition most commonly reported for those species in which more than one number has previously been recorded.

P. gaudichaudii embraces a diversity of leaf shapes and indumentum types and includes $2n$, $4n$ and $6n$ levels. Most populations studied are uniform within the small samples studied, but at Amosfield, on the far Northern Tablelands of New South Wales, both a tetraploid and a hexaploid were found. The ploidal levels do not show a clear geographical or ecological pattern, nor are they associated with the conspicuous morphological differences among the samples. The only sericeous-leaved population sampled is diploid (from Mt Kaputar) but the diploids also include subglabrous plants.

A feature of the general variation of *P. gaudichaudii* is the extensive intergradation with *P. varia* in western Victoria and in South Australia, in contrast to the distinctness of the two species elsewhere. The two species occur in close proximity at Tharwa, A.C.T., where *P. gaudichaudii* is diploid. However, *P. varia* is tetraploid at all localities studied, despite reports by Curtis (1967) of both diploids and tetraploids in *P. varia* in Tasmania. A morphologically intermediate sample from South Australia was tetraploid and it appears that the intergradation may be confined to the tetraploid level. Through the area of intergradation there are scattered occurrences of *P. gaudichaudii* showing no intermediacy, but there has not been an opportunity to check whether these are diploid. In much of New South Wales, however, tetraploids of both species occur, although not necessarily in the same or adjacent sites, and their greater distinctness there is not explained.

COMPARISON OF KARYOTYPES

Studies were made on root-tip material treated for $2\frac{1}{4}$ hours in saturated aqueous *p*-dichlorobenzene, fixed in acetic-alcohol, and stained with alcoholic-carmine (Snow 1963). Chromosome counts were based on several cells and often on several root-tips, but only a relatively small proportion of countable cells were suitable for drawing and measurement in the more detailed analysis of the karyotype.

These species show the presence of pericentric heterochromatin as found elsewhere in the genus (Stebbins and Day 1967) and the euchromatic terminal segments were often made conspicuous by the divergence of the chromatids in late prophase. The present work used rather highly condensed stages and the euchromatic and heterochromatic segments were not measured separately.

In the native species it was not practicable to identify all chromosomes of the complement, but two chromosome pairs were distinctive in most species. No differences between species were observed in the relative lengths of the remaining chromosomes, but close comparisons among these were not made. The identifiable chromosomes were:—

(A) sub-metacentric with a satellite on the slightly shorter arm, and

(B) the longest (sub-metacentric) chromosome pair.

Four replicates of each were distinguishable in the karyotypes of the tetraploids (Fig. 1). Both chromosomes A and B were distinguished in *P. cunninghamii* and *P. drummondii*, although these were not included in the statistical analysis. Chromosome A was also distinguishable in *P. muelleri*, although the high number prevented recognition of chromosome B.

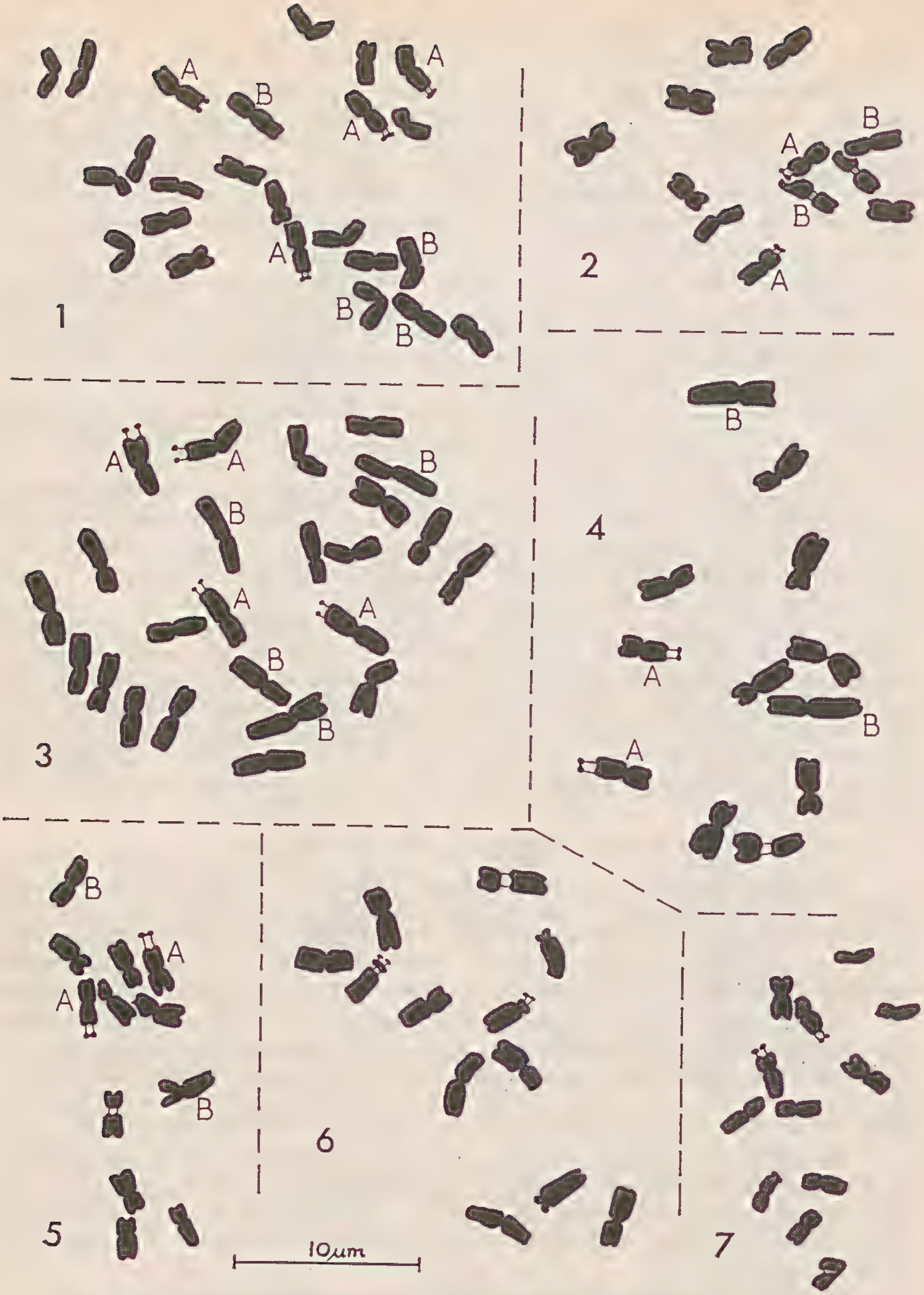

Fig. 1. Mitotic chromosomes of *Plantago*, × 2500 (1–5 native species, 6–7 naturalized in Australia)

1. *P. hedleyi*, Rodd 2n = 24
2. *P. glacialis*, Briggs 4532 2n = 12
3. *P. varia*, Flynn NSW 122082 2n = 24
4. *P. hispida*, Briggs 4066 & Carolin 2n = 12
5. *P. turrifera*, Thompson NSW 124896 2n = 12
6. *P. lanceolata*, Coveny 4367 2n = 12
7. *P. major*, Briggs 4481 2n = 12

Four attributes were determined for each of ten of the species (Table II).

TABLE II. CHROMOSOMAL ATTRIBUTES STUDIED

Chromosome	Attribute	Significance of inter-specific variation (from analysis of variance)
A	length of satellited chromosome (as % of haploid karotype of the cell).	not significant
A	satellited arm/total length satellited chromosome	significant ($P < 0{\cdot}005$)
B	length longest chromosome (as % of haploid karyotype of the cell)	significant ($P < 0{\cdot}025$)
B	short arm/total length	not significant

As this analysis deals only with a minority of the chromosomes of the set, it permits only very limited comparisons. Moreover sample sizes were unequal and for some species only measurements on a single well-spread cell were suitable for inclusion. Considerable variation of measurements arises from the orientation of individual chromosomes and from the different parts of a cell or a chromosome receiving uneven amounts of pressure during slide preparation. An example of the data is given in Table III in which the species are arranged in order of their means for this attribute.

TABLE III. LENGTH OF SATELLITED CHROMOSOME

(Expressed as % length of haploid karyotype of cell)

Species	No. of measurements	Mean*	S.D.*	Mean %†	% lengths of individual chromosomes measured†
gaudichaudii	4	25	1·5	18	18·1 15·1 20·6 19·4
turrifera	6	24	1·3	18	19·4 16·2 16·1 15·8 18·8 19·3
antarctica	4	24·0	0·2	17	16·1 16·7 16·9 17·7
alpestris	2	24	1·3	17	18·0 15·6
hedleyi	8	24	1·3	17	14·4 15·4 17·6 19·5 17·5 16·3 16·3 17·0
euryphylla	2	24	2·1	16	14·5 17·1
varia	12	23	1·5	16	13·1 15·7 15·2 12·3 15·8 15·1 15·9 18·0 15·6 19·0 15·9 17·6
glacialis	3	23	1·5	16	14·3 15·0 17·9
debilis..	2	22	0·6	15	15·5 14·4
hispida	2	22	1·0	14	13·3 15·1

* Calculated after angular transformation of data.

† Calculated without angular transformation.

Analysis of variance was carried out on the data for each of these four attributes (after angular transformation). No significant differences were observed in the lengths of chromosome A or in the arm ratios of chromosome B.

Where there were significant inter-specific differences, the order of the species means did not correspond with apparent taxonomic affinity. In both these cases the largest means were found in *P. hispida* and *P. debilis*, for each of which the sample size was minimal. Least Significant Range (Student-Newman-Keuls) tests (Sokal and Rohlf 1969) were applied to test the significance of differences between the species means. *P. hispida* was found to differ significantly in both these variables from the one or two lowest species means (from *antarctica* in the arm ratio of chromosome A and from *varia* and *euryphylla* in the length of chromosome B) but all other differences between means were not significant. This further test indicates that the significance found in the Analysis of Variance is due to the lack of conformation (non-normality) of the data and is not necessarily indicative of any discontinuity within it.

These studies indicate that there is considerable stability in the readily-analysable features of the karyotype. Even if one omits all species differing significantly in this analysis from any of the others in one or more of these aspects of chromosome morphology, the remainder represent most of the extremes of morphological variation among the species of the Australian mainland. They range from small alpine perennials to annuals of arid regions and, in Pilger's classification (1937) are divided among three Sections. The chromosomal uniformity suggests that the Australian species are allied and gives no support to the distinction of Sections among them. The grouping *P. glacialis*, *P. muelleri* and *P. palustris*, together with allies in Tasmania, New Guinea and New Zealand, is particularly distinctive in morphology but it is questionable whether this should be singled out for recognition or whether current distinctions should be maintained. The description of further species not known to Pilger, with the capsule structure of Sect. *Oliganthos* but with some similarities to Sect. *Mesembrynia*, has made the distinction between these Sections less clear.

In contrast to the stability in karyotype among the native species, the naturalized species present a diverse array. *P. coronopus* is the only species studied here with $n = 5$ and has a prominent pair of satellited chromosomes. In *P. lanceolata* the satellited chromosome arm is extremely short and one other chromosome pair is also highly asymmetric (Fig. 1). In *P. major* the karyotype is more similar to that in the Australian species but the latter have larger chromosomes than have *P. major*, *P. coronopus* or *P. hirtella*.

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A New Species of *Sporobolus* (Gramineae) from Eastern Australia

JAN C. DE NARDI

SUMMARY

A new species, *Sporobolus creber*, is described and distinguished from *S. elongatus* with which it has been confused.

Sporobolus creber *J. De Nardi*, **sp. nov.**

S. elongato R. Br. affinis. Panicula angusta, interrupta, ramis brevibus (ad 6 cm longis) rigidis, adscendentibus vel adpressis, spiciformibus; rami quam internodia breviores, e base spiculas parvas (1·25–1·75 [1·5 ± 0·01] mm*) dense crebras ferentes; spicula late hians caryopsidem ostendens; caryopsis circa 2/3 longitudine spiculae aequans.

HOLOTYPE: NEW SOUTH WALES: Warrumbungle Range, approx. 30 miles E. of Gulargambone, W.J. McDonald NSW 121997, 20.5.1971.

Erect caespitose perennial, 40–140 cm high, with a contracted oblique rhizome, sometimes forming quite large tussocks. *Innovations* intravaginal, but occasionally extravaginal. *Culms* glabrous, striate, 2- to 3-noded, sometimes branching from the lower nodes, the nodes glabrous. *Sheaths* glabrous with a ciliate margin, the cilia longer in the auricular region and sometimes extending a short distance along the margin of the leaf. *Ligule* membranous with a ciliate margin, less than 0·5 mm long. *Blades* up to 30 cm long, 2–3 mm broad at the base when flattened, expanded or folded when dry, the under surface furrowed, glabrous but slightly scabrous towards the tip, the upper surface more strongly furrowed and scabrous (sometimes quite densely so) for most of its length, the margins scabrous but sometimes smooth for a short distance at the base above the long cilia. *Panicle* at length exserted, 20–60 cm long, narrow, distinctly interrupted (at least towards the base), the peduncle and rhachis glabrous, lightly grooved. *Branches* stiff, ascending to appressed, spike-like, racemose, up to 6 cm long, usually much shorter than the internodes especially in the lower part of the panicle but occasionally longer, bearing spikelets from the base. *Spikelets* glabrous, shortly pedicellate, densely crowded, gaping widely and revealing the grain, dark green or more or less lead-coloured at maturity, at length straw-coloured, 1·25–1·75 (1·50 ± 0·05) mm long. *Glumes* thinly membranous, hyaline and somewhat shining, nerveless, the lower glume broadly ovate to oblong, 0·40–1·00 (0·63 ± 0·02) mm long, the tip rounded but often torn, the upper glume ovate to broadly ovate with an acute tip, 0·60–1·20 (0·85 ± 0·02) mm long. *Lemma* thinly membranous, hyaline and somewhat shining, obscurely 1-nerved, ovate with an acute tip, 1·20–1·75 (1·48 ± 0·02) mm long. *Palea* similar to the lemma but shorter, 1·10–1·60 (1·37 ± 0·02) mm long. *Anthers* 2, about 0·05 mm long. *Grain* obovate to oblong, truncate to slightly concave at the top, 0·50–0·85 (0·68 ± 0·03) mm long, about 2/3 the length of the spikelet.

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* Measurements are given in the form: range, followed by mean ± standard error of the mean. For *S. creber* means are based on one measurement on each of 51 collections. (See also Table 1.)

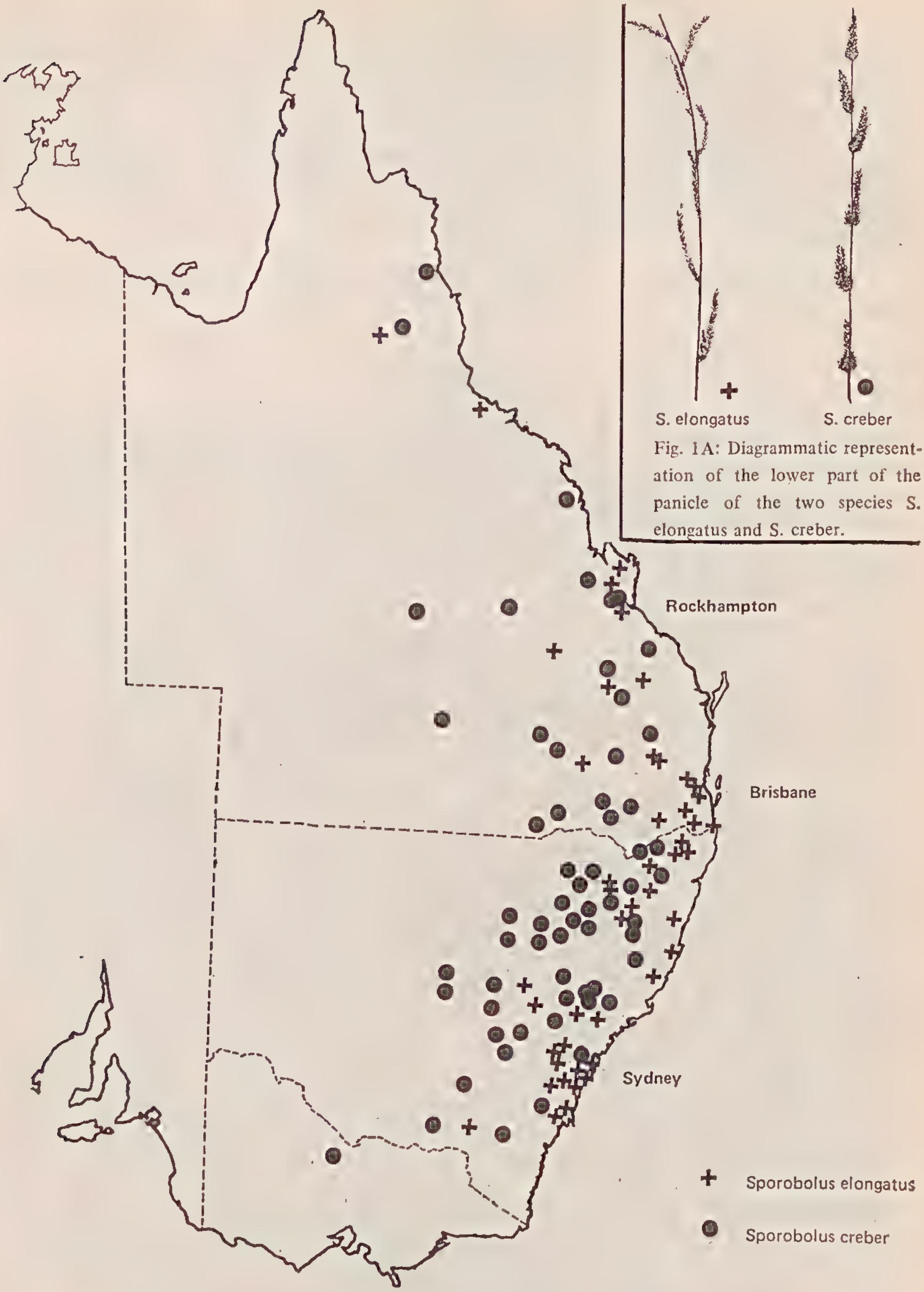


Fig. 1A: Diagrammatic representation of the lower part of the panicle of the two species S. elongatus and S. creber.

Fig. 1. : Distribution of Sporobolus elongatus and S. creber in Eastern Australia.

Widely distributed in open grassland or *Eucalyptus* woodland, on sandy or loamy soils, often near creeks. In New South Wales this species occurs mainly on the Western Slopes, extending eastwards on to the Tablelands and westwards to the nearer Western Plains. Around Sydney it is found along railway lines and at Araluen it occurs along the roadside, suggesting that it may be an introduction into these areas. In Queensland, which has less well-defined longitudinal climatic zones, the species appears to occur in similar habitats but is found in some localities close to the coast. It extends into northern Victoria. The three records from the Pacific Islands (Fiji and New Caledonia) may well represent introductions into these areas.

The distribution of *S. creber* and *S. elongatus* in Eastern Australia is shown in Fig. 1.

AUSTRALIA

QUEENSLAND: *Cook:* Mossman River, Brass No. 2173, 2.1932 (BRI); Stannary Hills. Bancroft, 5.1909 (BRI). *Mitchell:* "Winooka" near Yalleroi, Adams, 12.1959 (BRI). *South Kennedy:* Mackay, Blake No. 13329, 3.1938 (BRI). *Leichhardt:* Blackdown Tableland, c. 32 km E. of Blackwater, 23° 05′ S., 149° 0′ E., Henderson No. 809, Andrews and Sharpe, 3.1971; Minerva, N. of Springsure, Blake No. 6950, 7.1934 (BRI; NSW; MEL). *Port Curtis:* Rockhampton, Blake No. 19939, 5.1956 (BRI); Rockhampton, Simmons NSW 121993, 1907; Biloela, Cowdrey, 1930 (BRI). *Burnett:* Ceratodus, Phyall, 1931 (BRI); Mundubbera, Bloxsome, 1930 (BRI); Wondai district, Watson, 1931 (BRI). *Wide Bay:* Bundaberg, Michael, (BRI); Cinnabar, Whelan, 3.1956 (BRI). *Warrego:* Charleville, Blake No. 5545, 5.1934 (BRI; NSW; MEL). *Maranoa:* 20 miles [32 km] N. of Roma on Injune Road, 26° 15′ S., 148° 42′ E., Jacobs No. 273, 5.1972; Mitchell, Blake No. 5711, 5.1934 (BRI); Wallumbilla, Blunden No. 21, & No. 5, 4.1931 (BRI); Narine, SE. of Dirranbandi, Blake No. 10700, 3.1936 (BRI; NSW). *Darling Downs:* Chinchilla, Maiden NSW 121987, 3.1909; Chinchilla, Beasley, 12.1930 (BRI); between Inglewood and Milmerran, White No. 9771, 1.1934 (BRI); "Kindon" c. 54 miles NNE. of Goondiwindi, Smith No. 531, 12.1938 (BRI); Inglewood, Boorman NSW 121989, 3.1911; "Woodlands", Bungunya, 42 miles ENE. of Talwood, McDonald No. 19, 12.1960 (BRI); Wallangarra, Blake No. 4425, 1.1933 (BRI).

NEW SOUTH WALES: *North Coast:* Singleton, Boorman NSW 121765, 11.1914; Singleton, G.B. Vickery NSW 121766, 4.1931; Singleton, J.W. Vickery NSW 121767, 12.1934. *Central Coast:* Turramurra near Station, Blakely NSW 121768, 3.1924 (NSW; BO); Telopea, Carlingford Railway Line, 4 miles from Parramatta, Cross NSW 121769, 1931; Flemington, J.W. Vickery NSW 121770, 6.1929. *South Coast:* Araluen, Moore No. 2442, 3.1952; Araluen, in township, De Nardi No. 518, 11.1970. *Northern Tablelands:* 1 mile W. of Maryland on Wylie Creek road 28° 32′ S., 152° 00′ E., Jacobs No. 370, 5.1972; Glen Innes–Tenterfield 20 miles, Carolin No. 999, 5.1959 (SYD); Glen Innes, Menzies NSW 121992, 6.1908; Fairborn, McKie NSW 121980, 1.1948; University, Armidale, Consett Davis NSW 121981, (ex Herb. Rodway) 1.1941; Armidale district, Dinning NSW 121982, 4.1956; Dangarsleigh area, SE. of Armidale, Jessup & Gray No. 121, 3.1952. *Central Tablelands:* Orange, Reynolds NSW 121984, 2.1910. *Southern Tablelands:* c. 3 miles S. of Tharwa, lower footslope E. of Mt Tennent, A.C.T., Pullen No. 3056, 2.1962. *North Western Slopes:* Warialda, J.W. Vickery NSW 18024, 1.1932; Warialda, Rupp NSW 121754, 3.1906; Inverell, Thomas NSW 121755, 8.1912; Molroy via Bingara, Noble NSW 121757, 10.1938; Nangarah near Barraba, Rupp NSW 121990, 3.1914; 6 miles N. of Tamworth, Rodway NSW 121759, 4.1949; railway line near Curlewis, Pescott NSW 121758, 4.1917; Bugaldie Creek, Bugaldie, Constable NSW 15980, 3.1951; Currabubula, Pidgeon, 2.1934 (SYD); Coonabarabran, Nicholson NSW 121760, 2.1933; "Top Walga", Warrumbungle, Smith NSW 121996, 4.1971; 2–3 miles NW. of Weetaliba, De Nardi No. 366, 4.1970. *Central Western Slopes:* "Belltrees" via Scone, White NSW 121742, 2.1920; Merriwa, Cheel NSW 121741, 3.1924; Narramine [Narromine], Helms NSW 31621, 11.1892 (NSW; SYD); Gungal, Boorman NSW 121744, 11.1914; "Mirabooka", Castle Rock–Muswellbrook Road, Jacobs, 5.1969 (SYD); 20 miles from Singleton on Muswellbrook road, Hunter Valley, Story No. 6898, 11.1959; Mudgee, Fazle NSW 121744, 2.1911 (NSW; K; BO); Fifield, Beadle, 2.1914 (SYD); Trundle, Kearney NSW 121746, 2.1972; Mandagery, Pearce NSW 121747, 3.1955; Cowra district, Daniel NSW 121978, 4.1953; Cowra, Butler NSW 121749, 3.1972; Cowra, Breakwell NSW 750, 1.1915 (NSW; K; BRI). *South Western Slopes:* Billabong Creek, Rand, McBarron No. 2964, 1.1949 (SYD); Hume Highway, Holbrook, McBarron No. 694, 7.3.1947 (SYD). *Western Plains:* "Yallaroi"

Table 1

	Sporobolus elongatus				*Sporobolus creber*			
	Type Specimen*		Other Collections		Type Specimen		Other Collections	
	Mean & S.E. of Mean	Range	Mean & S.E. of Mean	Range	Mean & S.E. of Mean	Range	Mean & S.E. of Mean	Range
No. of Measurements	10	10	50	50	12	12	51	51
No. of Specimens measured	1	1	50	50	1	1	51	51
Total length of spikelets (mm)	..	..	1·88 ± 0·01	1·65–2·30	1·55 ± 0·01	1·40–1·70	1·50 ± 0·05	1·25–1·75
Lower glume length (mm)	0·80 ± 0·10	0·70–1·00	0·76 ± 0·02	0·30–1·10	0·73 ± 0·05	0·45–1·00	0·63 ± 0·02	0·40–1·00
Upper glume length (mm)	1·05 ± 0·03	0·90–1·20	1·06 ± 0·03	0·70–1·40	0·95 ± 0·03	0·80–1·10	0·85 ± 0·02	0·60–1·20
Lemma length (mm)	1·85 ± 0·02	1·80–2·00	1·80 ± 0·02	1·55–2·25	1·48 ± 0·03	1·25–1·60	1·48 ± 0·02	1·20–1·75
Palea length (mm)	1·77 ± 0·06	1·70–1·90	1·56 ± 0·02	1·35–1·90	1·29 ± 0·03	1·10–1·40	1·37 ± 0·02	1·10–1·60
Grain length (mm)	..	..	0·82 ± 0·04	0·50–1·00	0·73 ± 0·02	0·65–0·85	0·68 ± 0·03	0·50–0·85
Grain/Spikelet	..	..	0·56 ± 0·01	0·48–0·67	0·64 ± 0·03	0·61–0·68	0·61 ± 0·02	0·53–0·73
Branch/Internode	3 ± 1 (n = 3)	1·57–4·91	1·60 ± 0·10 (n = 21)	0·77–2·80	..	..	0·54 ± 0·05 (n = 20)	0·23–1·11

The mean and standard error of the mean, and the range (both in mm) for the diagnostic characters of the type specimens and otner collections of *S. elongatus* R. Br. and *S. creber* J. De Nardi.

The ratio Grain/Spikelet is the ratio of the length of the grain in situ in the spikelet to the total length of the spikelet.

The ratio Branch/Internode is the ratio of the length of the second lowest inflorescence branch to the length of the internode adjacent to it. (The number of measurements used is indicated.) The mean and standard error of the mean for this ratio shows an important diagnostic difference for the two species.

* Measured on the syntype at Kew labelled "East Coast".

Station between Moree and Warialda, Campbell NSW 121762, 3.1897; Moree, Cleland NSW 121763, 1.1912; Narrabri, Maiden NSW 121764, 11.1899; "Glenwood", Nymagee, Thompson NSW 121994, 10.1971; "Burchong Creek", Warrowie, c. 20 miles S. of Nymagee, Cunningham NSW 121998, 2.1972.

VICTORIA: Rochester, Raleigh 4.1933 (MEL).

PACIFIC ISLANDS

FIJI: Nadarivatu, Suckling SUVA 3651, 6.1940 (SUVA); Lautoka to Ba River, Cheel NSW 122086, 7.1918.

NEW CALEDONIA: Nouméa, Franc No. 2141, 3.1913 (BRI).

In the collection at the National Herbarium of New South Wales this species has been included under *S. elongatus.* It was necessary, therefore, to establish the correct application of the name *S. elongatus* before making a comparison between the two. There are two specimens of *S. elongatus* from Robert Brown's collection in the herbarium at the Royal Botanic Gardens, Kew. These are syntypes, as indicated by W.T. Stearn in the Preface to the facsimile edition of R. Brown, Prodr. (1960), p xxvii–xxviii, and as far as I know, no lectotype has been chosen. One sheet is labelled "R. Brown, Iter Australiense, 1802–5, 6207, Sporobolus elongatus, East Coast", and the other "Ex Hb. R. Brown, Port Jackson, J.J. Bennett". I have not seen these sheets, but Mr John Carrick, while he was Australian Botanical Liaison Officer at the Royal Botanic Gardens, Kew, measured 10 spikelets on the former sheet, and these have been compared with the measurements of 10 spikelets from the type specimen of *S. creber* (see Table 1). Mr George Chippendale measured the lengths of the second lowest inflorescence branch and the internode adjacent to it for the ratio given in table 1. He also compared the size and density of the spikelets on an inflorescence of *S. creber* with those of Robert Brown's specimens as well as those on an inflorescence of a specimen which I had referred to *S. elongatus*, and reported that the specimen sent as the latter agreed with the specimens of Robert Brown. There are also two collections in this herbarium (NSW) annotated by J.W. Vickery: "agrees closely with R. Br.'s specimens at Kew, 3/6/1938". Thus the application of the name *S. elongatus* appears to be established, although there are indications that this name covers a range of material showing considerable variation, and may contain more than one taxon. However, *S. creber* is clearly separable from this complex.

The two species, *S. elongatus* and *S. creber*, may be distinguished using the following criteria:—The panicle of *S. creber* is generally much more interrupted for more of its length, with short, stiff, appressed or slightly spreading branches whereas *S. elongatus* has a panicle which may be interrupted in the lower 2 or 3 internodes only, and has longer branches less closely appressed to the main rhachis of the panicle. However, because the branches are somewhat spreading, the panicle often appears to be interrupted. The lengths of the second lowest branch on the panicle, and the internode between the second and third nodes from the base of the panicle were measured and the ratio of the length of the branch to the length of the internode was calculated. In *S. creber* the branch is about half the length of the internode, while in *S. elongatus* it is much more variable and about one and a half times as long as the internode. In Table 1 this is shown in the figures for the ratio Branch/Internode. The figures for the mean and standard error of the mean show that overlap in this ratio between these species is restricted to very few specimens. The grain of *S. creber* is about two-thirds of the length of the spikelet, but the grain of *S. elongatus* is about half the length of the spikelet.

The spikelets of *S. creber* are small (1·25 to 1·75 mm long) and densely crowded on the branches of the panicle, whereas those of *S. elongatus* are longer (1·65 to 2·30 mm long) and more loosely arranged on the branches of the panicle. Examination of the figures in Table 1 show that, although there is some overlap in the range for each character, the means and standard errors indicate consistent differences. As can be appreciated from these figures, the proportions and general appearance of the inflorescence are more distinctive than the classical and readily quantifiable characters, such as spikelet length and grain size. However, it is difficult to quantify such gross morphological characters without some loss of information. Fig. 1A is a diagrammatic representation of the lower part of an inflorescence of both species, (the lower part being chosen, since it is less likely to be lost or broken away). This shows the difference in appearance of the inflorescence of the two species, resulting from a combination of all the characters discussed above. Although there is some overlap in individual characters, and occasional specimens may be difficult to assign, there is no evidence of extensive intergradation. *S. creber* forms a coherent assemblage and is sufficiently distinct to warrant specific rank in a genus in which such fine distinctions have previously been used (Clayton, 1965).

ACKNOWLEDGEMENTS

I wish to thank Dr Joyce Vickery for valuable guidance and discussion, Mr S. Jacobs who spent a great deal of time on the statistical analysis, and Mrs J. Walsh for the map and illustration.

LITERATURE CITED

Clayton, W.D., 1965.—Studies in the Gramineae: VI. The *Sporobolus indicus* Complex. Kew Bull. XIX, 287–293.

A New Genus of Papilionaceae and Related Australian Genera

ALMA T. LEE

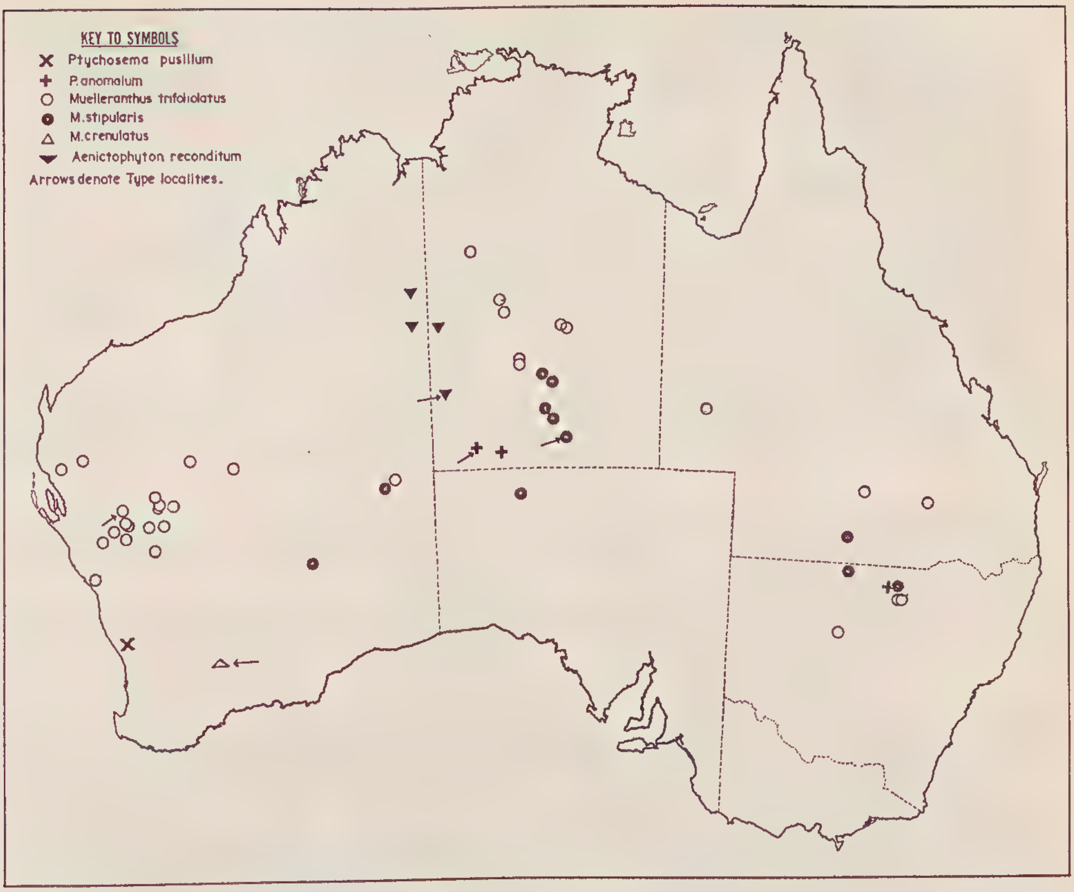
SUMMARY

A new genus of Papilionaceae, *Aenictophyton*, is described, and the genera *Ptychosema* and *Muelleranthus* (with one new species, *M. crenulatus*, and one new combination, *M. stipularis*) are revised. Classification of these taxa and a few related genera in the tribes of Papilionaceae is discussed.

The discovery in recent years of two unnamed plants, and the appearance in New South Wales of a rare species previously recorded only from Central Australia, have drawn attention to a number of Australian Papilionaceae, ascribed in Bentham's classification of the family to the tribes Genisteae and Galegeae (Bentham and Hooker 1865).

The new plants are described below as *Aenictophyton reconditum*, in a monotypic genus, and *Muelleranthus crenulatus*; the rare species is *Ptychosema anomalum*, one of only two species in a genus of which eight collections comprise the full representation in Australian herbaria. Included in the revision are two other species, one of which was recently removed (and another here follows) from *Ptychosema* to the new genus *Muelleranthus* by Hutchinson (1964). These three genera, comprising only six species between them, are largely eremean in occurrence (Burbidge 1960); some are very rare and none really common. They are related in one important aspect to plants which are familiar in more temperate parts of both eastern and western Australia. These are the genera *Bossiaea*, *Platylobium*, *Hovea* and *Templetonia* of the subtribe Bossiaeinae, tribe Genisteae (Bentham l.c.), the genus *Goodia* (anomalous in any proposed position), and the less familiar genera *Lamprolobium*, *Rothia* and *Plagiocarpus*, all in tropical Australia. *Rothia*, which was recorded from Australia by Bentham (1864), seems from descriptions to be very similar to *Plagiocarpus*, but its 'strophiolate' seed is different from that of the Australian genera and there are other characters which relate it to African Crotalarieae (Polhill, pers. comm.). Its two species occur in India and Africa.

All these genera, both rare and familiar, are linked by one common character, a character which has proved important diagnostically in the classification of Papilionaceae, namely an androecium of ten stamens joined in a sheath which is open adaxially (*Hovea chorizemifolia* is exceptional in having the vexillar stamen free). Bentham, in his classification gave greater weight to leaf characters, and as a result assigned *Ptychosema*, *Goodia* and *Plagiocarpus* (as


KEY TO SYMBOLS
× Ptychosema pusillum
+ P.anomalum
○ Muelleranthus trifoliolatus
● M.stipularis
△ M.crenulatus
▼ Aenictophyton reconditum
Arrows denote Type localities.

Map 1, showing distribution of the species of *Ptychosema*, *Muelleranthus* and *Aenictophyton*.

alternative positions), and *Lamprolobium* to his tribe Galegeae, where their pinnate or trifoliolate leaves are mostly in accord with the prevailing condition in that tribe. These relationships are discussed in the final section of the paper.*

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* It is appropriate to say here, that my conclusions regarding these relationships were largely tentative. They comprised chiefly the recognition of a new character, the Bossiaeoid form of seed aril, supported in some cases by features of anther dimorphism, as significant. When my script was ready for the press, I learned of partly concurrent work on Genisteae sens. lat. by R.M. Polhill at the Herbarium, Kew, then already submitted to the University of Reading as a thesis for the degree of Ph.D. Dr Polhill has generously communicated to me the relevant parts of his thesis, and his extensive work, of world scope in considerable detail, is at present being prepared for publication. It covers the small segment of genera and characters which I had surveyed in seeking to place a new genus in the family, brings other new characters to light, and results in technical support for relationships, some of which had been disputed or at best only conjectural. It has cleared up doubts and errors in previously accepted classifications which it would be idle to perpetuate here, and I have therefore added Polhill's conclusions regarding each genus in the final section, and altered my text on *Ptychosema*, *Muelleranthus* and *Aenictophyton* to accord with his classification, as will be evident below. For similar reasons I have adopted the more clearly defined terminology for the aril (in place of strophiole) used by Polhill, and occasionally added to descriptions.

Many collections have accumulated since Bentham's work was published, and as this material has never been reviewed as a whole, I have revised *Ptychosema* and *Muelleranthus* here. As a preliminary to the revisions, the essential characters of all these genera are summarized in the following key:

KEY TO THOSE AUSTRALIAN PAPILIONACEAE WITH TEN STAMENS JOINED IN AN OPEN SHEATH

1. Flowers axillary, solitary or in small clusters or occasionally in (? apparent) racemes.
2. Leaves simple or unifoliolate (exceptionally: pinnately 1-5-foliolate in *Templetonia hookeri*) .... *Platylobium*, *Bossiaea*, *Hovea* and *Templetonia*
2.* Leaves compound.
3. Leaves pinnately 1-7-foliate .... *Lamprolobium*
3.* Leaves digitately trifoliolate.
4. Style upturned; Australian genus .... *Plagiocarpus*
4.* Style straight or downturned; doubtfully Australian .... *Rothia*

1.* Flowers terminal on stem and branches, or leaf-opposed, solitary, racemose or paniculate.
5. Anthers nearly equal in length; keel not beaked; seeds ovoid to spherical without a marked radicular lobe.
6. Flowers in extended racemes or panicles, terminal on stems and branches; seeds arillate; shrubs, usually above 50 cm high.
7. Leaves pinnately trifoliolate; seeds with a large hooded aril (Fig. 22) .... *Goodia*
7.* Leaves unifoliolate; seeds with a small hooded aril (Figs. 15, 29) .... *Aenictophyton*
6.* Flowers few or solitary, leaf-opposed or in small terminal racemes; seeds not arillate; small plants with prostrate stems or erect to c. 15 cm.
8. Leaves digitately trifoliolate; stems prostrate; flowers 1-few in leaf-opposed racemes .... *Muelleranthus*
8.* Leaves pinnate; stems erect; flowers 1-few in terminal racemes ..*Ptychosema*
5.* Anthers strongly dimorphic, 5 long and 5 short; keel beaked; seeds oblique-cordiform to oblong-reniform, often with a well developed radicular lobe .... *Crotalaria*

Explanatory Notes on the Text

In the text below, all specimens cited as Types have been examined, unless otherwise specified; they are not repeated among citations of specimens examined.

In descriptions, terms used to describe shape of parts are mostly taken from those defined and illustrated in Chart 1a of the Systematics Association Committee (see Bibliography), and the numbers in parentheses following the terms (e.g. SAC 7), are also taken from that chart.

PTYCHOSEMA

Ptychosema Benth. in Lindl., A Sketch of the Vegetation of the Swan River Colony, in Append. to first 23 vols. Edwards's Bot. Reg. (1839) xvi.

Type Species: *P. pusillum* Benth., l.c.

Small herb-like plants with prostrate to ascending, more or less scantily pubescent stems, and some evidence of perennial, deep roots capable of budding off new vertical shoots. *Leaves* imparipinnate with opposite leaflets, stipulate. *Inflorescence* terminal and, if more than one on a stem, leaf-opposed: a raceme of one to several flowers on a slender, erect peduncle. *Flowers* shortly pedicellate, bracteate and bracteolate, variously described as whitish, pinkish, buff to deep purple, or yellow with the outside orange. *Calyx* with five teeth scarcely differentiated into two lips, the two upper segments slightly broader and joined higher up than the remaining three, or all more or less equal, the teeth about equal in length to the tube; calyx narrowed below the tube into a solid receptacle shorter than or nearly equal to the tube. *Standard* limb nearly semi-circular, ecallose, erect behind the other petals; *wings* and *keel* more or less obtuse, all with short claws. *Stamens* all joined in a sheath open adaxially, *anthers* uniform, dorsifixed. *Ovary* glabrous, shortly stipitate, with several ovules, a glabrous, upturned style, and terminal stigma. *Pod* (known only in *P. anomalum*) flattened, on a slender stipe about as long as the calyx, rounded-oblong in outline. *Seeds* (Figs. 1, 2) with a rim-aril only, the radicle curved, less than half as long as the cotyledons (Polhill, p.c.). Endemic in Australia with two species, one in Western Australia, the other in the Northern Territory (Central Australia) and northwestern New South Wales.

KEY TO THE SPECIES

1. Flowers solitary, pedicellate and on a slender peduncle ....*P. pusillum* 1.
1.* Flowers few to several in a pedunculate raceme ....*P. anomalum* 2.

1. Ptychosema pusillum *Benth.*, l.c.; Fl. Austral. II (1864) 201; Gardner, Enum. Pl. Austral. Occ. (1930) 64; Blackall & Grieve, W. Austral. Wildflowers I (1953) 241.

HOLOTYPE, not seen: WESTERN AUSTRALIA. Bentham cited no specimens with his original description, but in Flora Australiensis cites the presumed Type material as Swan River, Drummond, 1st coll., and n. 251. MEL 26464, which I have examined, is a specimen of this species and bears only the data: Drummond 281. Considering the rarity of this plant and the fact that there is confusion in the writing on the field label—the 8 has been written over, though it is not clearly corrected to a 5—it is reasonable to assume that this sheet is Isotype material.

Small fine-stemmed, erect plants mostly 5–10 cm high, scantily pubescent with a few loosely spreading, relatively long, basifixed hairs on leaves, buds, stems, peduncles, pedicels and calyces. *Roots* incomplete in the specimens available, described as "stock perennial, underground", and suggesting a structure similar to that of *P. anomalum* below. *Leaves* pinnate, with (5–) 7–9 (–11) leaflets, and small, straight, narrow, sparsely haired stipules; *leaflets* narrow-obovate (SAC 45–46), without stipellae, the 3–4 pairs of parallel lateral veins rather prominent below, the apex acute to almost truncate or very slightly retuse, with an apiculate tip usually reflexed. *Inflorescence* terminal on the stem and branches, comprising a solitary pedicellate flower on a slender peduncle, the pedicel bracteate at its junction with the peduncle and with a pair of bracteoles near or above the middle; bract ovate, green and thin-textured like the bracteoles. *Flowers* rather large, deep red to brown and yellow in colour. *Calyx* rather obscurely two-lipped, but the two upper teeth broader and joined higher up than the lower three, all with a median vein and minutely dark-stippled, the teeth equal to or shorter than the tube; receptacle at the base of the calyx short. *Standard* with a transversely elliptical (8) limb and a slender claw, dark red-brown drying purplish outside, deep yellow inside fading to duller yellow with red patches, the veins pale yellowish like the 'eye', their dichotomous branching very distinct in dried specimens. *Wings* obliquely oblong, deep red-brown, with small auricles. *Keel* obtuse coloured and with small auricles like the wings, or paler. *Ovary* glabrous, shortly stipitate, with a short style and terminal punctate stigma; ovules 4. *Pod* unknown.

Stems 5–11 cm, leaves 1–4 cm long; leaflets 2–10 mm long, 1–2 mm broad; hairs of pubescence c. 0·75 mm long; flowers 12–15 mm long, the pedicel 6–10 mm, the peduncle 3–4 cm long; calyx teeth 2·5–3·5 mm long, the tube 2–2·5 mm, the receptacle 1·5–2 mm; standard, including the claw of c. 2 mm, 12 mm long, 13 mm broad; wings, including the claw of 2 mm, 10 mm long, 2·5 mm broad; keel 7 mm long (including the claw of 2 mm), 1·5 mm broad; ovary 5 mm long on a stipe of c. 1·5 mm, the style c. 1·5 mm.

DISTRIBUTION: southwest of Western Australia; only known habitat: in sand; *Banksia*-jarrah (*Eucalyptus marginata*) woodland. See map, p. 413.

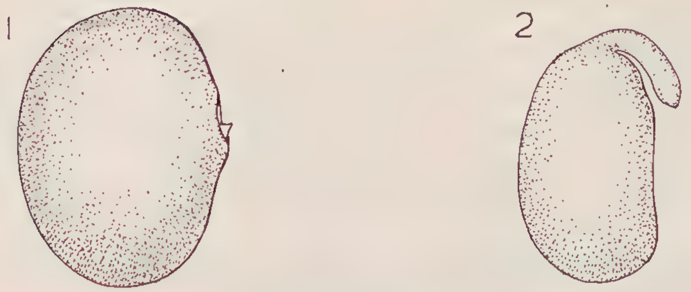
SPECIMENS EXAMINED: WESTERN AUSTRALIA: **South Western Province:** *Darling District:* Head of Gingin Brook, N. of Gingin, George No. 11153, 10.1971 (PERTH); "Western Australian Plants collected by J. Burton Cleland" (NSW 99937, undated, but from other sources probably between 1902 and 1913).

2. Ptychosema anomalum *F. Muell.*, Fragm. Phytogr. Austral. IX (vi. 1875) 62; Black, Fl. S. Austral. ed. 2, II (1948) 448.

HOLOTYPE: NORTHERN TERRITORY: *Central Australia:* Mt Olga, Giles 1873/4 (MEL 26461). ISOTYPE: MEL 26462.

Small plants very similar in habit and pubescence to *P. pusillum*, the stems sometimes taller, to c. 20 cm. *Roots* spreading horizontally underground and giving rise to vertical roots, and these, above ground, to leafy branches. *Leaves* midgreen, imparipinnate, often broken in herbarium specimens, but with c. 2–5 pairs of opposite leaflets similar in size to the not distant terminal leaflet; *leaflets* obovate (SAC 45–49), entire, more or less sparsely pubescent on both sides with rather long hairs, the minutely apiculate or sometimes blunt tip often downturned and the sides folded upwards along the midrib when dried, the blade penninerved with about 6 pairs of parallel veins, attached to the upper side of the rachis by a very short, yellowish petiolule, without stipellae. *Stipules* narrow-triangular, acute, often deciduous. *Inflorescence* a terminal (and leaf-opposed if more than one) raceme, rarely slightly compound, in the few complete specimens with 5–9 flowers. *Flowers* "buff to deep purple", or orange and yellow, subtended by a cymbiform, green bract, and with a similar pair of bracteoles on the upper half of the pedicel; *bract* sometimes caducous. *Calyx* with five teeth all apiculate, the upper two sometimes truncate with lateral points and joined a little higher than the rest, the tube contracted at the base into the receptacle; calyx marked with dark longitudinal striping along edges of the teeth, through the sinuses to the base. *Standard* yellow outside, orange inside, the limb nearly semi-circular in outline, i.e. transversely elliptical (SAC 8) in the few available for dissection, with a slender claw. *Wings* obtuse with a small auricle. *Keel* rather deep, obtuse and perhaps without a distinct auricle. *Staminal sheath* slightly shorter at the edges than at the centre, the *anthers* uniform, oval in outline. *Style* glabrous with a terminal stigma, the ovary glabrous and on a slender stipe. *Pod* compressed, rounded-oblong, the fawn-coloured surface stippled with purplish markings, the stipe slightly exceeding the calyx. *Seeds* (Figs. 1, 2) elliptical-oblong (SAC 4, 16), uniformly greenish brown, with a small tongue-like extension of the rim-aril.

Stems to 20 cm long; leaves c. 5 cm; leaflets 2–6 mm long and 1–1·5 mm broad; stipules 1–3 mm long; flowers 10–14 mm long on a pedicel of c. 3 mm; calyx teeth, calyx tube and receptacle all of about equal length (2 mm); standard



Figs. 1–2, del. R.M. Polhill. *Ptychosema anomalum*—1, immature seed, wet state, × 9. 2, embryo, × 9.

8·5–9 mm long including the slender claw of 2·5–3 mm, 8 mm broad; wings 8 mm long including the claw of 2 mm, and 2 mm broad; keel 5–7·5 mm long including the claw of 1·3–2 mm, and 2·5 mm broad; anthers c. 0·25 mm long; pod 14–16 mm long, 5 mm broad, the stipe c. 4–7 mm long; seeds c. 3 mm long.

Distribution: a rare plant or sometimes locally frequent, in sandhills and sandy soil in eremean zones of New South Wales and Central Australia. See map, p. 413.

Specimens Examined: New South Wales: *Western Plains:* E. of Narran Lake between McPhees Yards Junction and "Remington", McGillivray No. 2923, 11.1967 (NSW). Northern Territory: *Central Australia:* 2 miles [3 km] NE of Ayers Rock, Henry 469, 9.1972 (NSW) Ayers Rock, Newman 9.1955 (MEL 26463); 20 miles [32 km] E. of Ayers Rock, Turvey 8.1968 (NSW 114120).

MUELLERANTHUS

Muelleranthus Hutchinson, Gen. Fl. Pl. I (1964) 361.

Type Species: **M. trifoliolatus** (*F. Muell.*) *Hutch. ex A. Lee.**

Herb-like, more or less pubescent plants of prostrate habit, with slender stems radiating from a central root. *Leaves* digitately trifoliolate, stipulate, petiolate, with obtuse leaflets. *Inflorescence* leaf-opposed, the flowers solitary or two or three in a raceme, on short pedicels and longer, slender peduncles. *Calyx* differentiated into lips, not always clearly. *Stamens* all joined in a sheath open adaxially, with uniform anthers. *Ovary* shortly stipitate, with 6–8 (–10) ovules, the style glabrous and stigma terminal. *Pod* where known compressed. *Seeds* not arillate, but sometimes with a temporary, fine, white hooded aril later absent, the radicle short but bent (*fide* Ewart & Kerr, 1926). Endemic in Australia with three species in eremean (or near-eremean) zones of Queensland, New South Wales, the Northern Territory and Western Australia.

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* Dr Hj. Eichler, Keeper of the State Herbarium of South Australia, has pointed out to me that the publication of the binomial *Muelleranthus trifoliolatus* is "not in accordance with the Code", because the Basionym, though clearly enough indicated, is not accompanied by a "full and direct reference . . . to its . . . original publication with page or plate reference and date" (International Code of Botanical Nomenclature (1966) Art. 33, par. 4). I am therefore compelled to add my own name to that of Hutchinson as author of the combination.

KEY TO THE SPECIES

1. Leaflets entire. Ovary glabrous.
    2. Plants glabrous or with a sparse pubescence. Leaflets obcordate. Stipules mostly 2–4 mm long and less than 1·5 mm broad. Standard 9–14 mm broad .... *M. trifoliolatus* 1.
    2.* Plants pilose with spreading hairs. Leaflets usually obovate, less commonly slightly obcordate. Stipules mostly 3–6 mm long and 2–4 mm broad. Standard 3–4 mm broad ....*M. stipularis* 2.

1.* Leaflets crenulate-toothed, the lateral veins ending in the minute projections of the margin. Plants sparsely pubescent with rather long, soft hairs. Ovary pubescent ..*M. crenulatus* 3.

1. Muelleranthus trifoliolatus (*F. Muell.*) *Hutch. ex A. Lee*, **comb. nov.;** Hutch. in Gen. Fl. Pl. I (1964) 361, comb. invalid.

HOLOTYPE: WESTERN AUSTRALIA: **Eremean Province:** *Ashburton or Austin District:* Upper Murchison River, Gale 1881 (MEL 26470). ISOTYPE: MEL 26471.

BASIONYM: *Ptychosema trifoliolatum* F. Muell. in Wing's Southern Science Record II (1882) 72; Tate, Handb. Fl. Extratrop. S. Austral. (1890) 59, 66; Moore & Betche, Handb. Fl. N.S.W. (1893) 148; Tate in Spencer, Rep. Horn Exp. Part III, Sect. 2, Botany (1896) 153; Maiden & Betche, Census N.S.W. Pl. (1916) 107 (as *P. trifoliastrum*); Ewart & Davies, Fl. N.T. (1917) 145 (as *P. trifoliatum*); Gardner, Enum. Pl. Austral. Occ. (1930) 64; Black in Trans. Roy. Soc. S.A. LXII, 1 (1938) 103; Black, Fl. S. Austral., ed. 2, II (1948) 448; Blackall & Grieve, W. Austral. Wildflowers I (1953) 241.

Small prostrate, herbaceous plants with long, fine, sometimes reddish, stems up to c. 50 cm long, radiating from a central tap root, glabrous or scantily pubescent on the stems and peduncles, more densely on the pedicels, and rarely on the leaves, petioles, stipules and calyx teeth, with appressed to spreading hairs. *Leaves* digitately trifoliolate on slender petioles; *leaflets* entire, usually slightly emarginate at the apex, i.e. obcordate, rarely truncate or shortly acute, i.e. obovate (SAC 47–50), mostly glabrous, occasionally with a few loosely appressed hairs, the lateral veins obscure; stipules present, stipellae absent. *Inflorescence* leaf-opposed, usually of 1 or 2 (occasionally 3) flowers which are pedicellate, bracteate and bracteolate on a slender, glabrous or sparsely appressed-pubescent peduncle. *Flowers* yellow, or usually with some of the petals, especially the keel, at least partly brown, reddish or purplish; pedicel short, spreading-pubescent; bract at the junction of peduncle and pedicel narrow, similar to the pair of bracteoles on the upper half of the pedicel. *Calyx* of five similar teeth nearly equal to the tube, the two upper teeth united higher up than the rest, their free part usually 1 mm long; a contracted base (receptacle) not evident below the calyx. *Standard* yellow or orange, banded around the 'eye', and sometimes to the edge, with dark purplish brown between the veins. *Wings* usually orange or yellow with some dark purplish brown flushes. *Keel* crimson or darker, at least distally, obtuse or almost circular in the upper half. *Ovary* glabrous, shortly stipitate, the style slender, glabrous, and the stigma terminal; ovules about 10, perhaps 7–11. *Pod* flattened, narrow-oblong, pinkish fawn, usually finely stippled with reddish flecks, the slender stipe elongating to about the length of the calyx. *Seeds* spherical, at first uniformly coloured, when mature with brick red and pale mottling, at first with a reduced hooded aril as in *Aenictophyton* q.v., finally not arillate.

Leaves, including petioles, (4–) 8–14 (–25) mm long; leaflets (1·5–) 2–3 (–8) mm long, 1–3 (–7) mm broad; stipules (1–) 2–3 (–4·5) mm long and 0·5–1·5 (–3·5) broad; peduncles (12–) 15–50 (–110) mm long; pedicels c. 3·5 mm long; calyx (3–) 4·5–5·5 mm long; standard 9–10 (–15) mm long including the claw of 2·5–3 mm, 9–10 (–14) mm broad; wings 8–9 (–12) mm long including the claw of

1·5–2 mm, 1·5–2·5 (–4) mm broad; keel 7–9 (–11) mm long including the claw of 1·5–2 mm, 3–4·5 mm broad, pod (13–) 17–25 (–29) mm long, 4–5 (–6) mm broad; seeds c. 2 mm in diameter.

DISTRIBUTION: Mostly on red sandy soils with *Triodia* and *Acacia aneura s. lat.* in eremean zones of Queensland, New South Wales, Northern Territory and Western Australia; also in creek beds, around waterholes in shaded situations, on floodouts, and 'in *Dichanthium* grassland' (Queensland). See map, p. 413.

SPECIMENS EXAMINED: QUEENSLAND: Mulligan R, Cornish 1885 (MEL 26469); Charleville, Clemens 10.1945 (MEL 26468); 36 miles (58 km) W. of Roma, Beadle 5.1963 (NSW 114252). NEW SOUTH WALES: *Western Plains:* "Pulpulla" near Cobar, Andra 1885 (MEL 26467). NORTHERN TERRITORY: 81 miles [130 km] S. of Hookers Creek Settlement, Chippendale NT 2296, 7.1956 (AD); Wycliffe Creek, Ewart 6.1924 (MEL 26481); 1·9 miles [3 km] E. of Wycliffe Creek crossing, Stuart Highway, Nelson No. 692, 4.1963 (NSW, AD); Curlew Waterhole, Lander River, 70 miles [113 km] NW. of "Willowra" Head Station, Chippendale NT 4805, 7.1958 (PERTH; NSW; AD); Lander Creek, camp III N.T. Survey, Hill No. 306, 6.1911 (MEL 26482); Long Waterhole, "Coniston" Station, Latz No. 1180, 1.1972 (NSW); "Coniston", c. 220 km NW. of Alice Springs, Cleland 8.1936 (AD 95830038). WESTERN AUSTRALIA: **Eremean Province:** *Ashburton District:* Kennedy Range, Teichert 9.1948 (MEL 26480); 651 mile peg, Great Northern Highway, George No. 3624, 3.1962 (PERTH); Gascoyne R. Forrest 1882 (MEL 26474, 26475, 26479; NSW 114253; PERTH); Gascoyne R. Pollack 1882 (MEL 26472); Gascoyne R. Gardner No. 6090, 9.1941 (PERTH); 92 miles [148 km] NE. of Wiluna, George No. 5602, 7.1963 (PERTH); 27 miles [43 km] NW. of "Belele" Homestead, Speck No. 646, 9.1957 (NSW, PERTH); "Belele" Station, Goodall No. 3076, 8.1965 (PERTH); 2 miles [3 km] S. of "Belele" on road from Meekatharra, Aplin No. 2496, 8.1963 (PERTH); 8 miles [13 km] W. of Meekatharra, Speck No. 598, 9.1957 (PERTH). *Austin District:* Upper Murchison R. Tyson No. 68, 1892 (MEL 26478); "Boolardy" Station, Murchison R. Gardner 7.1927 (PERTH); "Boolardy", near pool, Humphries 9.1950 (PERTH); "Wooleen" Station, Humphries 9,1950 (PERTH); Whalloo Rocks, "Coodardy" Station, NW. of Cue, Main 9,1968 (PERTH); "Nallan", N. of Cue, Gardner No. 7833, 10.1945 (PERTH); "Murgoo" Station NE. of Mullewa, Ashby No. 2547, 8.1968 (PERTH); Murchison R. Weston 1892 (MEL 26476); 29 miles [47 km] W. of Mt Magnet, George No. 7963, 9.1966 (PERTH); "Yowergabbie" Station, Mt Magnet, the Manager 8.1960 (PERTH). *Carnegie District:* Barrow Range near Mt Squires, Helms 8.1891 (AD 96820306; MEL 26477). ? *District:* E. of Geraldton, 1889 (MEL 26473).

2. M. stipularis (*J.M. Black*) *A. Lee*, comb. nov.

HOLOTYPE: NORTHERN TERRITORY: *Central Australia:* Bundoomah, J.B. Cleland 8.1936 (AD 95830040). ISOTYPE: MEL 26465.

BASIONYM: *Ptychosema stipulare* J.M. Black in Trans. Roy. Soc. S. Austral. LVII, 1 (1938) 103.

Similar in habit and habitat to the preceding species but differing in pubescence, leaf shape, and flower size and colouring.

Stems radiating from the central tap root, decumbent, clothed like most of the vegetative parts with a more or less dense pubescence of spreading hairs. *Leaves* digitately trifoliolate, petiolate; *leaflets* entire, broad-ovate (SAC 17–50) to rarely obcordate, the apex broadly acute, occasionally truncate or rarely slightly emarginate, pubescent on both surfaces or glabrous above in very old leaves. *Inflorescence* leaf-opposed (as in the illustration, though incorrectly described, in the protologue), comprising a solitary pedicellate flower on a slender, spreading-pubescent peduncle; peduncle bracteate at its junction with the pedicel but the small bract often fallen. *Flower* largely dark in colour, noticeably smaller than in *M. trifoliolatus*, the narrow bracteoles attached just below the contracted base of the calyx (receptacle) and less deciduous than the bract. *Calyx* sparsely to densely pubescent with spreading hairs, the narrow-ovate teeth about equal to the tube but the two upper teeth joined to within 1 mm of their tips and slightly broader than the lower three, the receptacle not very distinct. *Standard* drying purplish black, with a large, pale 'eye' above the slender claw, and clearly defined, pale, dichotomous veins. *Wings* similarly dark in colour, at least distally. *Keel* pale, yellowish, the limb nearly circular at the end. *Ovary* stipitate, glabrous, with 6–8 ovules, the style rather short and the stigma terminal. *Pod* flat, oblong, shortly tapered at both ends, with transversely reticulate venation and a distinct, firm but not thickened margin; *seeds* spherical, mottled with brick red and pale yellow, and at length with black; not arillate.

Stems from 4 cm long in small plants to 60 cm in a well grown specimen; leaves (4–) 7–15 (–25) mm long, the leaflets (2–) 3–5 (–9) mm long and (1·5–) 2–3·5 (–5) mm broad;[*] peduncle (7–) 15–20 (–40) mm long, the pedicel only 1–2 mm; bracteoles narrow, 1–1·5 mm long, the bract 2 mm long; calyx 3–4·5 mm long, the teeth and tube each c. 2 mm long; standard 4–6 mm long including the slender claw of about half the length, 3·5–4 mm broad; wings c. 5 mm long including the claw of 1–1·5 mm, and 1·5 mm broad; keel 4–6 mm long including the claw of c. 1–1·5 mm, and 2·5 mm broad; ovary 4·5–5 mm long, the stipe 1 mm; pod (15–) 20–25 (–30) mm long and (4–) 4·5–5 (–7) mm broad.

DISTRIBUTION: Usually in sandy soils both of ridges and flats, often found around clumps of spinifex (*Triodia* spp.) and perhaps locally common after fires in such areas; in Queensland, New South Wales, Northern Territory, South Australia and Western Australia. See map p. 413.

SPECIMENS EXAMINED: QUEENSLAND: "Gilruth Plains", Cunnamulla, McKee No. 10299 4.1963 (NSW). NEW SOUTH WALES: *Western Plains*: "Ellerslie", Enngonia, Whalley 4.1957 (NSW 114250); ½ mile [0·8 km] NNW. of Cumborah, Lee 3.1968 (NSW 114251); "Muttabun", Walgett, de Saram 11.1969 (NSW 113605) and 12.1969 (NSW 113618). NORTHERN TERRITORY: *Central Australia:* "Gibeanie" Station, Chippendale NT 1567, 8.1955 (AD); 5 miles [8 km] NW. of Aileron, Nelson No. 407, 8.1962) (NSW); 4 miles [6 km] N. of Connor Well, Chippendale NT 4681, 7.1958 (AD, NSW); 32·5 miles [52 km] SW. of Alice Springs, Chippendale NT 3070 (NSW, MEL); between James and Ooraminna Ranges, Tate 7.1894 (AD 96820278, NSW 114586); Central Australia, Tate 1894 (AD 96820299; NSW 114585). SOUTH AUSTRALIA: Far North: c. 3 km NW. from foothills of Mt Illbillee, Everard Ranges, Spooner No. 108, 9,1968 (NSW). WESTERN AUSTRALIA: **Eremean Province**: *Carnegie District*: 36 miles [58 km] SE. of Warburton, George No. 3902, 8.1962 (PERTH); 70 miles [113 km] W. of Neale Junction, Great Victoria Desert, George No. 8408, 10.1966 (PERTH).

3. Muelleranthus crenulatus *A. Lee*, sp. nov.

HOLOTYPE: WESTERN AUSTRALIA: **South Western Province:** *Eyre District:* 13 miles [21 km] S. of Mt Holland, E. of Hyden, 119° 45′ E, 32° 22′ S, A. S. George No. 9441, 7.1969 (PERTH). ISOTYPE: NSW.

Herbae parvae caulibus ad 8 cm longis, pubescentes pilis sparsiusculis mollibus ad 1 mm longis. Folia digitatim trifoliolata in petiolis tenuibus, stipulata. Foliola cuneata apiculata in sino apicale, marginibus crenulato-dentatis, venulis in dentibus terminantibus, supra glabra, infra plus minus pubescentia, sine stipellis. Stipulae teneres, acutae, solutae. Inflorescentia folia opposita, floribus 1–3. Flores brunnei flavique, pedicellati, bracteati et bracteolati. Pedicelli plus, pedunculi minus pubescentes. Calycis labia non distinctissima, dentibus duobus superioribus latioribus breve solutis, inferioribus tribus angustioribus tubum aequantibus brevioribusve. Receptaculum non manifestum. Vexillum in centro fuscum, oculum subflavum excludens. Alae obovatae, concolores. Carina obtusa fusca ad apicem. Germen molliter pubescens, in stipite tenui, stylo longiusculo et stigmate terminali. Ovula 4. Legumen ignotum.

Folia cum petiolis ad 2 cm longa; foliola 1·5–7 mm longa, 1–5 mm lata; stipulae plerumque 2–3 mm longae, 1 mm latae; pedunculi tenuissimi, 1·5–2 cm longi, pedicelli 3–5 mm; calyx 5 mm longus, dentibus tubum aequantibus

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[*] Stipules ovate, (2·5–) 3–5 (–6) mm long, (1–) 2·5–3 (–4) mm broad;

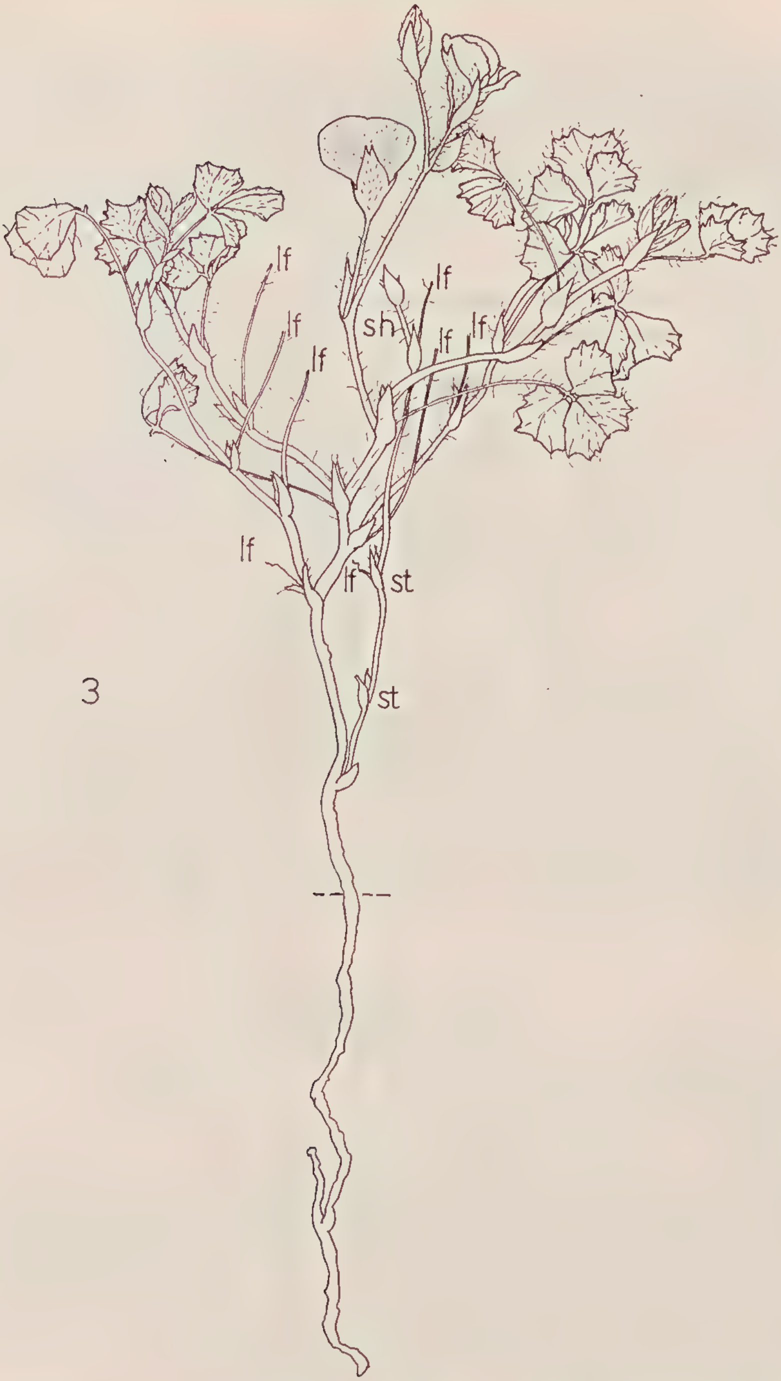

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Fig. 3. *Muelleranthus crenulatus*—a plant from the isotype sheet, × 2 lf leaf, sh shoot, st stipule.

brevioribusve, duobus superioribus ad 1 mm, inferioribus tribus longiore solutis; vexillum ungue 1·5 mm longo incluso 8 mm longum, 9 mm latum; alae ungue 1 mm longo incluso 6 mm longae, 1·5–2 mm latae; carina ungue 1·5 mm longo incluso, 6·5 mm longa, 2·5 mm lata. Germen stipite 1 mm longa, subanthesi 2·5 mm longum, 4-ovulatum. Fig. 3.

Small herbaceous plants with perennial underground parts and stems to c. 8 cm long in the Type, with a rather sparse pubescence of softly spreading hairs up to 1 mm long. *Leaves* digitately trifoliolate on slender petioles with a pair of cymbiform to elliptical (SAC 1–2) stipules; *leaflets* cuneate to broad-cuneate (SAC 88–90), with a small point in the shallow apical sinus, the margins crenulate-toothed with the few lateral veins ending in the points, the lamina glabrous above, more or less sparsely pubescent below; stipellae absent; stipules thin-textured, acute, free from each other, and with a few hairs like the stems. *Inflorescence* of 1–3 flowers in a leaf-opposed raceme. *Flowers* brown and yellow, pedicellate, subtended by a narrow-ovate or -trullate bract on the slender peduncle, and with a pair of similar bracteoles near the top of the pedicel; pedicel rather densely pubescent, the peduncle less so. *Calyx* not strongly bilabiate but the two upper teeth broader and joined higher than the three narrow-ovate lower ones, so that a broad, more or less truncate upper lip with two almost lateral points, and a lower three-toothed lip may result; receptacle not evident. *Standard* darker coloured towards the centre, except for the 'eye', the wings concolorous, more or less obovate, the *keel* darker, at least distally, obtuse. *Ovary* pubescent with long, soft hairs, on a slender stipe and with a rather long, slender style and minute, terminal stigma. *Ovules* 4. *Pod* not known.

Leaves including petioles from very small to c. 2 cm long; leaflets 1·5–7 mm long, 1–5 mm broad; stipules mostly 2–3 mm long, 1 mm broad; peduncles very fine, mostly 1·5–2 cm long, the pedicels 3–5 mm; calyx 5 mm long, the teeth equal to or shorter than the tube, the two upper teeth joined almost to the top or free for 1 mm; standard 8 mm long including the claw of 1·5 mm, 9 mm broad; wings 6 mm long including the claw of 1 mm, 1·5–2 mm broad; keel 6·5 mm long including the claw of 1·5 mm, 2·5 mm broad; ovary at anthesis 2·5 mm long on a stipe 1 mm long. Fig. 3.

DISTRIBUTION: WESTERN AUSTRALIA; known only from the Type specimen; habitat "in stony red loam, on recently burnt area". See map, p. 413.

AENICTOPHYTON

Aenictophyton *A. Lee*, **gen. nov.**

TYPE SPECIES: **A. reconditum** *A. Lee*, **sp. nov.**

Suffrutices foliis unifoliolatis stipulatis et racemis in caulibus ramisque terminalibus. Flores flavescentes fuscimaculati; petala unguiculata; calycis dentes superiores quam inferiores breviore soluti, tubus in receptaculum contractus. Stamina omnia in vagina supra fissa connata; antherae obscure dimorphae, alternatim dorsifixae basifixaeque, muticae. Germen 6-8-ovulatum; legumen compressum; semina arillata. Species adhuc cognita una.

Shrubby plants with unifoliolate, stipulate leaves, and terminal, racemose inflorescences on the stem and branches. *Flowers* yellowish with brown markings, the petals clawed, the upper calyx teeth joined for a greater part of their length than the lower, the calyx contracted below the tube into the receptacle. *Stamens* all joined in a sheath open adaxially, the anthers obscurely dimorphic, alternately dorsifixed and basifixed, without appendages. *Ovary* with several ovules, ripening to a flattened, oblong pod; *seeds* arillate. One species, endemic in Australia, in eremean zones of the Northern Territory and Western Australia.

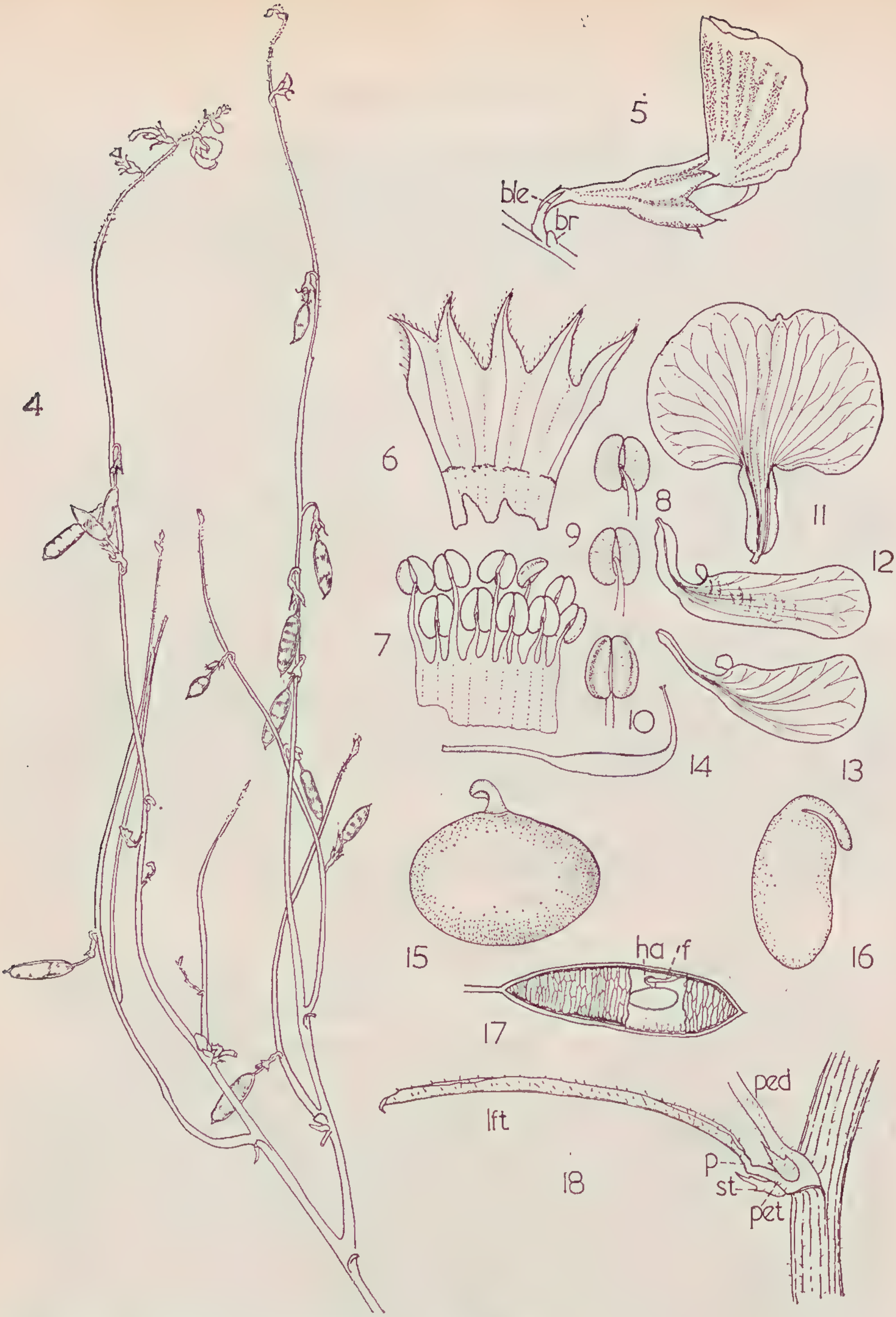
A genus generally similar in characters of flower and fruit to *Bossiaea* and *Goodia* and, particularly, to *Ptychosema* and *Muelleranthus*. From *Bossiaea* it is distinguished by its terminal inflorescence and also by its similar but reduced seed aril. Its unifoliolate leaves and reduced aril distinguish it from *Goodia* of which it has the habit and inflorescence. From *Ptychosema* and *Muelleranthus* it is distinct in its habit, extended inflorescence, permanently arillate seeds, and unifoliolate leaves.

1. Aenictophyton reconditum *A. Lee*, sp. nov.

HOLOTYPE: NORTHERN TERRITORY: *Central Australia:* Willis Rockhole, c. 30 miles [48 km] E. of Sandy Blight Junction, Butler No. 110, 5.1967 (PERTH, *bis*).

Suffrutex ad 60 cm altus, tereticaulis pilis rigide patentibus conspersus, glabrescens paucifoliatus. Folia (Fig. 18) interdum nulla, vel unifoliolata, in petiolo brevissimo, stipulis trullatis vel anguste trullatis, latioribus obscure et irregulariter dentatis, plerumque siccis in caulibus etsi crassiusculis. Foliola (6–) 10–20 (–27) mm longa linearia ad anguste elliptica in petiolulo 1–2 mm brevissimo, articulata et angulata in petiolo, breviter hispida, glabrescentia, venulis lateralibus paucis obscurisque, apice recurva. Racemi in caulibus ramisque terminales, raro ramosi, flores (Fig. 5) flavi vel aurantiaci maculis fuscis, in pedicellis brevissimis (1 mm) ad c. 9 mm longis; bracteae c. 2 mm longae in pedunculo et bracteolae c. 1 mm in pedicello medio, acutae, saepe caducae. Calyx breve hispidus, primo atropurpureo-vittatus dentibus superioribus solutis ad 1 mm, inferioribus tubo aequilongis in receptaculum longiusculum contractus. Petala omnia flava vel purpureo-fuscimaculata; vexillum (Fig. 11) ungue 1·5 mm longo incluso 8 mm longum, 6·5 mm latum; alae (Fig. 12) ungue 1·5 mm longo incluso 8 mm longae, 1·5 mm latae; carina (Fig. 13) obtusa, ungue 1·5 mm longo incluso 7 mm longa, 2·25 mm lata. Legumen (Fig. 17) oblongum, compressum, 15–17 mm longum, 4–5 mm latum in stipite 4–6 mm, corylinum, transversireticulatum. Semina (Figs. 15, 16, 29) plerumque 1–4, rotundate oblonga, arillo albo tenui.

A small perennial shrub about 60 cm high with wiry, finely ribbed, terete stems scantily clothed at first with stiffly spreading hairs, later glabrescent, and bearing relatively few leaves. *Leaves* (Fig. 18) sometimes absent, or unifoliolate, on a very short petiole, with a pair of trullate or narrower (54–57) stipules, the broader stipules obscurely and irregularly toothed, and usually dried (though of thickish texture) on the plant; *leaflets* linear to very narrow-elliptical (SAC 12, 1), on a very short petiolule, articulate and angled on the petiole, sparsely pubescent at first with spreading hairs on both surfaces but less so above, then glabrescent, often folded upwards along the rather prominent, light-coloured midrib, the lateral veins obscure and few, the tip often dried and more or less recurved. *Inflorescence* a raceme, terminal on the branches, perhaps occasionally branched near the apex of the plant and sometimes appearing axillary through suppression of the branch below the peduncle or through loss of the one or few leaves on the branch, so that it is not distinguishable from the peduncle. *Flowers* (Fig. 5) yellow or orange with some brown markings, pedicels sometimes very short (c. 1 mm), sometimes much longer (c. 9 mm) in the lowest flowers of an apical raceme, bracteate and bracteolate. *Calyx* (Figs. 5, 6) sparsely pubescent with spreading hairs on teeth and tube, when young greenish with distinct purple stripes edging at least part of the teeth, joining at the sinuses and continuing to the base of the receptacle but fading with age; calyx tube and teeth about equal in length, the two upper teeth free for only 1 mm; calyx contracted below the tube into the receptacle. *Standard* (Fig. 11) on a rather long claw, the limb nearly circular;



Figs. 4–18. *Aenictophyton reconditum*—4, habit, × 0·5. 5, flower, × 4 br bract, ble bracteole. 6, calyx showing the two adaxial lobes joined higher than the rest, × 4·5. 7, stamens from bud, spread out, × 13·5. 8, anther from same, back view, × 18. 9, anther from alternate stamen with filament inserted higher, × 18. 10, same, front view, × 18. 11, standard, × 4·5. 12, wings, × 4·5. 13, keel, × 4·5. 14, pistil, × 4·5, 15, immature seed, wet state, × 9. 16, embryo, × 9. 17, pod, broken to show attached seed, × 2. f funicle ha hooded aril. 18, leaf, × 4. lft leaflet, p petiolule, ped peduncle, pet petiole, st stipule. Figs. 6–16 del. R. M. Polhill.

wings (Fig. 12) and keel (Fig. 13) obtuse. *Petals* all concolorous or all with purple-brown markings above the 'eye' on the standard, and along the lower part of wings and keel. *Stamens* (Figs. 7–10) monadelphous, the sheath open adaxially, the filaments alternately longer and shorter (perhaps only in bud) and the anthers more or less circular, almost equal in size but obscurely dimorphic in their alternately higher and lower inserted filaments, without appendages. *Ovary* (Fig. 14) glabrous, stipitate on a slender gynophore with a rather short style and terminal stigma; ovules 6–8. *Pod* (Fig. 17) flattened, tapered more or less symmetrically at base and apex, the slender stipe exceeding the calyx, light or reddish brown with a pale, firm margin and transversely reticulate venation. *Seeds* often only 1–4, rounded oblong in outline, with a small, white, hooded aril (Figs. 15, 29); radicle curved (Fig. 16), slender, less than half as long as the cotyledons.

Petiole 1–2 mm long; leaflets (6–) 10–20 (–27) mm long on a petiolule of less than 1 mm; raceme 3–30 cm long with few to perhaps 20 flowers; flowers about 1 cm long, the pedicel very variable in length (1–9 mm); calyx teeth and tube each 1·5–2 mm long, and equal to the receptacle also 1·5–2 mm; standard 8 mm long including the claw of 1·5 mm, 6·5–7 mm broad; wings 8 mm long including the claw of 1·5 mm, 1·5 mm broad; keel 7 mm long including the claw of 1·5 mm, 2·25 mm broad; pod 15–17 mm long, 4–5 mm broad; seeds c. 2·5 mm long and 1·5 mm in diameter.

DISTRIBUTION: in deep red sandy soils along both sides of the Northern Territory-Western Australian border; recorded as grazed by cattle (Nelson No. 1926). See map, p. 413.

SPECIMENS EXAMINED: NORTHERN TERRITORY: *Central Australia:* 27 miles [43·5 km] SW. of Inningarra Range, Maconochie No. 936, 8.1970 (NSW). WESTERN AUSTRALIA: **Eremean Province:** *Carnegie District:* 30 miles [48 km] W. of "Mongrel Downs" Head Station, Maconochie No. 984, 4.1971 (NSW); Bloodwood Bore, Balweena Reserve, Nelson No. 1926, 8.1969 (NSW).

The generic name is derived from Gk. *ainiktos* baffling, and *phyton* a plant, in reference to difficulties in classification of the genus; the epithet, from Lat. *reconditus* hidden, is intended to indicate the long period of seclusion of the species in its remote habitat.

GENERIC RELATIONSHIPS IN THE GROUP

All the genera under consideration in this paper have previously been classified in the tribes Genisteae Benth. or Galegeae Benth. of the Genera Plantarum. The essential differences between these very broadly conceived tribes are as follows:—

	Tribe GENISTEAE	Tribe GALEGEAE
Stamens	10 joined in open sheath	9 joined, the vexillar stamen free
Inflorescence	of solitary or few axillary flowers, or terminal or leaf-opposed racemes or heads	racemes of ∞–1 flowers terminal on stems and branches
Leaves	simple, unifoliolate or digitately trifoliolate	pinnate, of 1–∞ leaflets

The genera considered here are more particularly related to one subtribe in each of these tribes, namely subtribe Bossiaeinae Benth. (as "Bossiaeae") of Genisteae, and subtribe Tephrosiinae Benth. (as "Tephrosieae") of Galegeae, both of these subtribes being accorded full tribal rank in Hutchinson's classification of the family (Hutchinson 1964). The particular characters of these subtribes, distinguishing them from other subtribes are, in Genisteae:

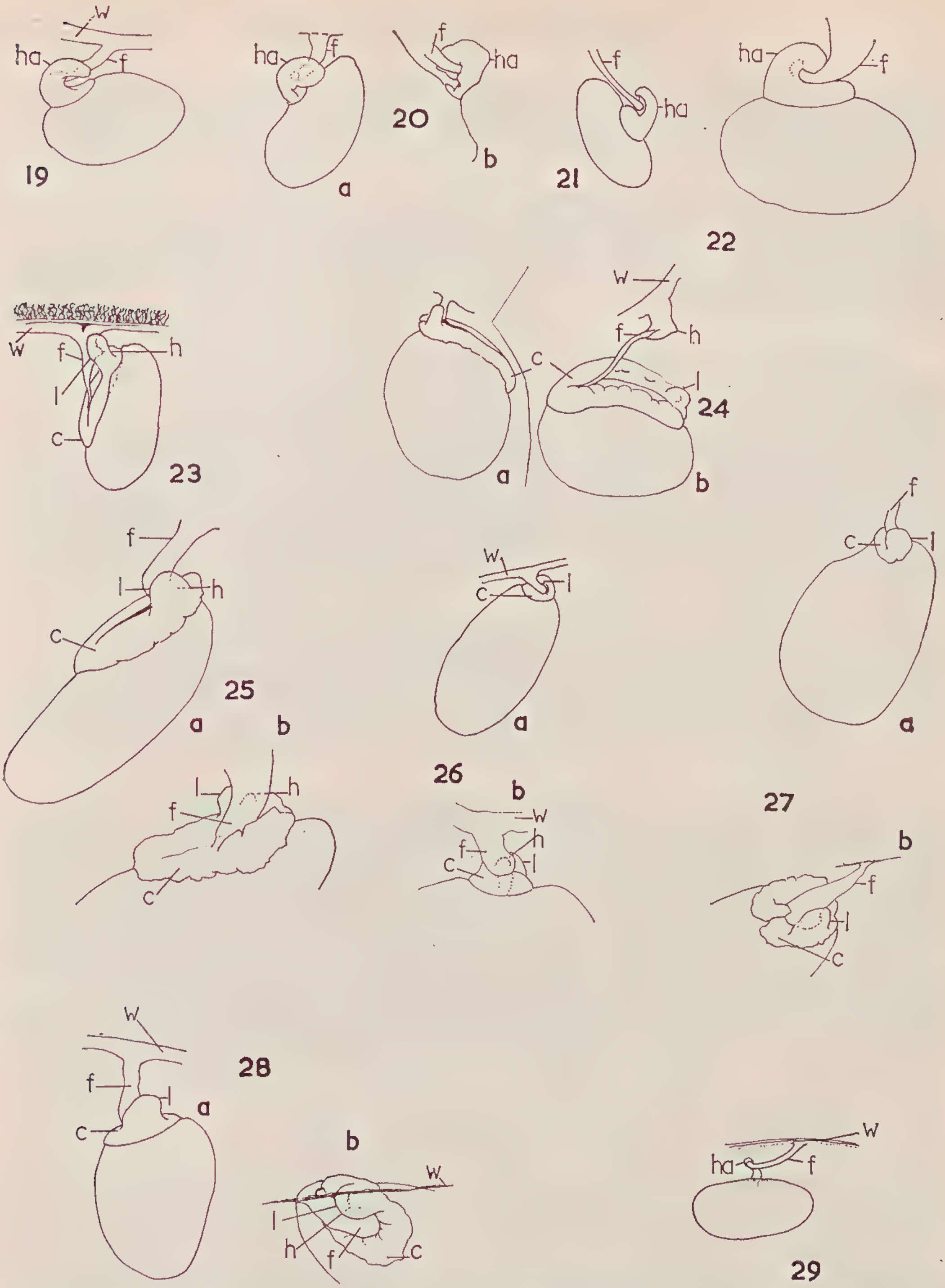
	Subtribe BOSSIAEINAE	Subtribes CROTALARIINAE Benth. (as "Crotalarieae") and SPARTIINAE Benth. (as "Spartieae")
Flowers	1-few in axils, rarely in racemes (perhaps cymes).	in terminal or leaf-opposed racemes or heads
Seeds	arillate	not arillate
Leaves	simple, unifoliolate or absent, exceptionally pinnate (as in *Templetonia hookeri*)	simple, unifoliolate or digitately compound or absent

In Galegeae, the subtribe Tephrosiinae differs from other subtribes, *inter alia*, in its vexillar stamen sometimes irregularly joined to the others, and in its inflorescence racemose but sometimes anomalous.

In attempting to place the new genus *Aenictophyton* in the existing hierarchy of Papilionaceae, I found that it was a plant which had all the important characters of the Bossiaeeae (Benth.) Hutch. except one, and that one an essential character of an opposing tribe. Thus *Aenictophyton* has the characters of Bossiaeeae except for its terminal, racemose inflorescence, a character of Galegeae Benth. In seeking further affinities, the presence and particular form of the aril on the seed of *Aenictophyton* assumed striking significance, correlated as it is with the androecium of ten stamens all joined in an open sheath. In all the genera of Bossiaeeae the aril assumes the same basic form, sometimes modified, sometimes embellished, but distinguished by the presence of a lobe of tissue in addition to that which develops all around the funicle. The aril may be circular round a cylindrical funicle, or oval to elliptical around a more or less elongate area of insertion of the funicle. The lobe forms always on the side of the funicle nearer to the carpel-margin, and the insertion of the funicle is thus obscured by the lobe in a normally opened pod.

In *Bossiaea*, *Platylobium* and *Goodia* the lobe is relatively large, arching up from the aril and enveloping the end of the funicle like a hood (Figs. 19–22). The funicle makes a hook-like connection with the seed through this hood. The same hooded aril is seen in *Aenictophyton*, but there it is small and slender (Figs. 15, 29), and the aril around the future hilum is reduced almost to extinction.

In *Templetonia* and *Hovea* (Figs. 23–27) the funicle enters the seed directly or is connected along an elongate line, and around it a more or less massive and sometimes ornate aril develops. Near one end, in the same position relative to the carpel-margin as the hood in *Bossiaea*, is a smaller lobe into which a heel of the funicle is firmly fitted; figs. 23 and 24b show the funicle partly torn from the seed to show this connection. The funicle appears to have no vascular connection



Figs. 19–29. Arillar structure in seeds of *Bossiaea* and related genera—19, *Bossiaea heterophylla*, × 5. 20, *B. walkeri*, a, × 5, b, funicular attachment, × 5. 21, *Platylobium formosum*, × 5. 22, *Goodia lotifolia*, × 5. 23, *Hovea* sp. var. *montana* (this taxon, generally recognized as var. *montana*, is variously referred to *H. longifolia* or *H. purpurea*), × 5. 24, *H. linearis*, a, × 5, b, showing the funicle partly pulled away, × 5. 25, *Templetonia retusa*, a, and b, from different sides, × 5. 26, *T. sulcata*, a, × 5, b, funicular attachment, × 10. 27, *T. hookeri*, a, × 5, b, funicular attachment from different angle, × 10. 28, *Lamprolobium fruticosum*, a, × 5, b, funicular attachment from other side, × 10. 29, *Aenictophyton reconditum*, × 5. c collar, f funicle, h heel, ha hooded aril, l lobe, w wall of pod (sometimes only a thin shred pulled off).

with the seed through the lobe in those species of *Templetonia* and *Hovea* which I have examined, except in *T. hookeri* where insertion seems similar to that in *Bossiaea* (Fig. 27).

The hooded aril, appearing in modified form in *Aenictophyton*, drew attention to other genera in which the same form of aril might occur, and these were examined where possible. When little or imperfect material was available I have had to rely on descriptions, but for future consideration the following observations are recorded.

Plagiocarpus: a monotypic, tropical Australian genus which is basically Bossiaeoid but has digitately trifoliolate, sessile leaves. Compound (1–5-foliolate) leaves, however, are now known in *Templetonia hookeri*, as well as in numerous unifoliolate* species of *Bossiaea*, *Platylobium* and *Templetonia*. *Plagiocarpus* was regarded as somewhat anomalous by Bentham when he described it, relating the genus to *Argyrolobium* in Crotalariinae; Hutchinson placed it in his Lotononideae which is not far removed from Bentham's proposed position. In both however, it is anomalous in its arillate seed. I have not seen the seed, but it is recorded by Polhill (1971) as similar to that of some species of *Templetonia*, e.g. *T. retusa* as in Fig. 25. Anthers in *Plagiocarpus* are obscurely dimorphic, as they are in *Templetonia hookeri* and *T. retusa* among Bossiaeeae and indeed in many of Bentham's Genisteae, as well as in *Lamprolobium* and *Aenictophyton* (see below). This condition indicates an affinity with Genisteae Benth. rather than with Galegeae Benth., judging from Hutchinson's key, and, taken with the arillate seed, a particular affinity with Bossiaeeae. These and other characters are adduced by Polhill, who refers *Plagiocarpus* to Bossiaeeae.

Lamprolobium: a monotypic, tropical genus from Queensland differing from Bossiaeeae only in its pinnate (1–7-foliolate) leaves (see Fig. 28 for arillate seed). Its anthers are obscurely dimorphic, five basifixed and five dorsifixed, so that it finds a complete parallel in, if not a great similarity to *Templetonia hookeri*. In that species as in *T. retusa*, the dimorphism of the anthers, usually strong in *Templetonia*, is reduced and largely limited to their fixation. This reduced anther dimorphism, seen also in *Plagiocarpus* and *Aenictophyton*, supports the hypothesis that all three genera are related to Bossiaeeae. *Lamprolobium* is placed by both Bentham and Hutchinson in the small Brongniartieae (as subtribe of Galegeae and as tribe respectively), and the resemblance to *Brongniartia* is indeed strong; *Brongniartia* however, has a free vexillar stamen though its flowers are axillary and its seeds strongly arillate as in *Lamprolobium*, while the third member of the tribe, *Harpalyce*, agrees with *Lamprolobium* in its stamens and seed but has terminal racemes. *Harpalyce* and *Brongniartia* are Mexican and South American genera, and the newly recognized relationship of *Lamprolobium* with Bossiaeeae casts doubts on the validity of Brongniartieae as a natural group, or at least on the inclusion in it of *Lamprolobium*. Polhill (1971) presents other evidence that *Lamprolobium* belongs in Bossiaeeae, and cites phytochemical evidence supporting its separation from Brongniartieae, though as yet without an adequate investigation of the American genera.

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* Leaves in Bossiaeeae have always been described as simple, but both Bentham and Mueller recognized their compound nature in descriptions of *Templetonia* (*Nematophyllum*) *hookeri*, though without using the term; they are described correctly as unifoliolate, for the first time, in a manuscript for the Flora of New South Wales by Mrs Joy Thompson of this Herbarium, and in Polhill's thesis (1971).

Goodia: a temperate Australian genus of one, or two very similar, species. Bentham regarded it as anomalous, with the stamens and seed (Fig. 22) of Bossiaeinae and the inflorescence and leaves of Galegeae Benth., but finally grouped it with Bossiaeinae. Hutchinson, giving weight to the distinct disc on the receptacle, placed it in his Millettieae, thus favouring the Galegeae Benth., though here it is at least equally a misfit. Now, however, in view of the pinnate leaves in *Templetonia hookeri*, and the terminal inflorescence in *Aenictophyton*, I consider the affinities of *Goodia* are with Bossiaeeae. Its anthers are uniform. Polhill places *Goodia* unequivocally in Bossiaeeae, using the character of anther connective as additional evidence.

Aenictophyton: a monotypic genus of eremean northwestern Australia. It differs from the traditional genera of Bossiaeeae only in its terminal racemes.

Muelleranthus: a genus of three species in dry parts of Australia. It was unknown to Bentham, and placed by its author, Hutchinson, in Lotononideae, and indeed bears a strong superficial resemblance to *Lotononis* itself. Ewart and Kerr (1926) referred it, by implication, to Bossiaeeae. Its close resemblance in floral characters to Bossiaeeae was countered by trifoliolate leaves and leaf-opposed flowers.

Ptychosema: a genus of two similar species, both rare, in Australia. It has been referred to Tephrosieae by both Bentham and Hutchinson (as subtribe of Galegeae and as tribe, respectively). Here, inclusion in Bossiaeeae, as indicated by the floral characters, was countered by pinnate leaves and terminal flowers, as well as by the exarillate seed.

The last three genera, so closely similar in flower and fruit both to each other and to some species of *Bossiaea*, would thus be widely separated within Papilionaceae on existing criteria, though I had accepted this condition, having little more than a superficial acquaintance with the relevant extra-Australian genera. Polhill, however, has brought evidence from new characters to support the inclusion of both *Muelleranthus* and *Ptychosema* in Bossiaeeae near *Platylobium*, *Bossiaea* and *Goodia*. *Aenictophyton* now appears as an intermediate member of a series comprising *Goodia*, *Aenictophyton*, *Muelleranthus* and *Ptychosema*, all with terminal inflorescence, variously compound leaves, successively reduced (finally to extinction) hooded arils, and comparable features of anther and embryo; they are certainly to be included in Bossiaeeae.

ACKNOWLEDGEMENTS

This work has been greatly assisted by the loan of collections from the National Herbarium of Victoria, the State Herbarium of South Australia and the Western Australian Herbarium, and I extend my sincere thanks to the Directors of these institutions. In particular I am indebted to Mr A.S. George and Mr J.R. Maconochie for special collections, of *Ptychosema* and *Muelleranthus*, and of *Aenictophyton*, respectively. Dr L.A.S. Johnson made a number of corrections to my Latin descriptions, and Mrs J. Thompson has assisted me by discussion. The distribution map is the work of Mrs J. Walsh.

It is evident from the text that I am greatly indebted to Dr Polhill, and it is a pleasure to acknowledge his help by correspondence, and particularly his generous permission to cite from his thesis while his own publication of the content is still being prepared.

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The Algal Genus *Scenedesmus* in Australia

VALERIE MAY

SUMMARY

Previous records of the algal genus *Scenedesmus* in Australia have been examined. Some corrections are made, some synonymy is indicated, also a survey and key are presented of those species and varieties now recognized as occurring here, together with their distribution. *S. abundans* is recorded in Australia for the first time and a definite occurrence of *S. opoliensis* is recorded. An attempt is made to link recent work on morphological variation within the genus with serial observations made at Braidwood, N.S.W. It appears that in stable species the number of cells occurring in a coenobe at any one time can differ in different bodies of water in the same district, so that in this region this difference is not dependent on major climatic changes. Addition of alums to the water of a lake was also shown to affect cell number.

Variation within a species or genus is usual, but recent studies of various groups of algae have illustrated the extreme difficulty in separating variation due to environmental influences from that due to hereditary differences. Hence the true limits of species in such groups remain ill-defined. Examples of this confusing variation are:—

1. In the *Ectocarpus* complex (Phaeophyceae), Ravanko (1970) indicates that there is extreme plasticity in the group, and concludes that "delimitation of species in the Ectocarpales is no longer possible solely on the basis of morphological characters".

2. Wide variation and interchange of form has led Drouet (1963) to link 54 taxa in a range of genera in the Blue-green algae as ecophenes of a single species.

3. Bliding (1948) has separated as two "species" apparently morphologically identical plants of *Enteromorpha* (a Green alga) by differences which only appear, when they are cultured. Thus, under certain conditions the plants appear identical but under other conditions they differ morphologically and appear as distinct species. One would, however, expect to be able to obtain all intermediate forms between these two apparent species by culturing throughout a range of conditions.

4. Lewin & Robertson (1971) claim that bacteria-free cultures of filamentous *Asterocytis* can change to uni- or bicellular units resembling *Chroothece*, when the culture medium is changed.

5. In the genus *Scenedesmus*, morphological variation is extreme and has sometimes been associated with and induced by change in external conditions (see Trainor & Hilton, 1963, and Trainor et al., 1971, for further discussion). Kessler & Czygan (1967), however, conclude that a high degree of morphological differentiation in *Scenedesmus* is associated with a remarkable uniformity in the biochemical characters so far studied. Trainor & Hilton (1963) stress that many species of *Scenedesmus*, in culture, fragment into

unicellular forms which resemble *Chlorella*, *Rhaphidium* (*Ankistrodesmus*), *Oocystis*, etc., or form a *Dactylococcus*-like stage, so that the genus *Scenedesmus* may need to include other genera, now recognized as distinct. Again, Swale (1967) cultured an apparent *Chodatella*, which appeared to change into a *Scenedesmus*. If these two genera do need to be united, the name *Scenedesmus* must be retained.

Culturing has shown that polymorphism occurs in those factors most used for the separation of species in *Scenedesmus*, viz. size and shape of cells, unicellular versus coenobial condition, as well as position and number of spines or appendages (if present). Despite this, it has been found possible to recognize in the field reasonably distinctive, morphologically separated forms which can conveniently be considered as species.

Smith (1916) and Chodat (1926) have each published extensive and detailed reports on the genus *Scenedesmus*. These two workers have been rather at cross purposes. Chodat was at pains to show the extent of genetic variation, so that his numerous species were often indistinguishable unless cultured under specific conditions.* Smith, on the other hand, tried to define his species as units which could be recognized by a competent student with the use of a microscope only. A further difference was that Smith followed the Rules of Nomenclature for priority of publication, etc., whereas Chodat says (p. 163) "il vaut mieux abandonner ces anciens noms, toute identification étant hasardée".

With such different aims and premises, it is surprising to me that the results obtained show a large degree of correlation, so long as one regards Chodat's species complexes (each including a number of allied species) as corresponding to Smith's species, and the numerous additional species of Chodat as infraspecific units.

Based on this scheme, the species so far recorded, illustrated, or now reported from Australia are considered. In the references given under each taxon, the reference to Smith (1916) should be consulted for a complete list of synonymy.

Species of the genus *Scenedesmus* have been recorded on various occasions in the literature of the Australian freshwater algae. Unfortunately some of these scattered references were not included in the world reviews of the genus cited above. Further, even when a collection is cited by an author, it is sometimes impossible to determine from a herbarium sheet or a tube full of algae which is the actual plant intended (consisting of a few cells only).

My interest in the genus was first aroused by the frequency of its appearance in an ecological analysis on which I have been engaged at Braidwood, Southern Tablelands, N.S.W.

Recently the National Herbarium of New South Wales has been fortunate enough to obtain from the Linnean Society of New South Wales a valuable series of drawings by the late G.I. Playfair, Australia's foremost student of freshwater algae. These drawings are beautifully executed and represent observations made by Playfair on many specimens of this genus. In some cases, the drawings are completely labelled with locations and are associated with the originals of those which appeared in his publications. These drawings are the basis for recognizing one species (*S. brasiliensis*) as occurring in N.S.W., and for considering that certain records (e.g. *S. opoliensis*) may be wrongly based. Where Playfair's drawing accords with a species name employed in the present paper and is labelled with that name or includes that name as a synonym, the record is accepted. Where the name associated with the drawing differs from that used here, discussion is given (e.g. for *S. armatus*).

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* After long observation, he reports that no new forms appeared suddenly, needing to be explained as mutations.

It is useful to combine various literature references and information from Playfair's extensive drawings with my own observations.

As a result I have presented a survey of and a key to those species now recognized from Australia, together with their distribution on this continent as far as is known. *S. abundans* is recorded from Australia for the first time and *S. opoliensis* is definitely recorded for Australia in place of the previous doubtful record. *S. reniformis* Playfair is relegated to the list of insufficiently known species. *S. securiformis* Playfair, *S. ralfsii* Playfair and *S. curvatus* Playfair are reduced to infraspecific rank or synonymy, and several other corrections are made. The known distribution of species in Australia is given but it is to be expected, from overseas experience, that the distribution of the species will prove to be widespread.

Of the 14 species now listed from Australia, 10 represent collective species or a major section in Chodat's scheme (which includes 14 such groups, one of which, *Clathrodesmus*, is very dubious according to Bourrelly, 1966, p. 217). Chodat considered *S. acutiformis* and *S. brasiliensis* to be closely allied to *S. armatus*, whereas he placed *S. perforatus* in the same section as *S. quadricaudus*.* He also considered *S. carinatus* and *S. opoliensis* under the same section as each other. These four Australian species have not been studied in detail, and may later need to be sunk in synonymy.

References and notes are given for each of these 14 species and those of their varieties which occur here (pages 437 to 447), and a key is included on page 437. Keys to the infraspecific units are provided under the respective species.

Unless otherwise stated, specimens cited are in the National Herbarium of New South Wales (NSW), as are all the cited drawings by Playfair. Authors and dates quoted under distribution lists refer to publications.

Recent work by Trainor (1964, 1966) indicates that some species within the genus *Scenedesmus* are stable and do not vary greatly with conditions of culturing, while other species are unstable and, according to conditions of culture, can appear as a range of other "recognizable species".

Records of stable species include *S. abundans*, *S. bijugus*, *S. quadricaudus*, *S. longus* (Trainor, 1964) and *S. denticulatus* and *S. dispar* (Trainor, 1966). One unstable species (Trainor & Roskosky, 1967), from axenic culture, produced colonies resembling *S. quadricaudus*, *S. longus*, *S. abundans*, *S. bijugus* and *S. acutiformis*, as well as unicells resembling the genus *Franceia*, according to conditions of culture. Another unstable species (Trainor, 1966), obtained from culturing an individual coenobe in an axenic culture, showed forms resembling *S. longispinus*, *S. armatus*, *S. quadricaudus*, *S. semipulcher* and also unicells similar to *Chodatella*.

Thus it seems that there is a series of true-breeding distinctive species and/or forms of *Scenedesmus* and also a series of unstable species which can simulate a number of the above. A form found in the field can be identified, with the aid of a microscope, as one of the recognized species but so far only culturing has been able to indicate whether it is indeed this pure breeding species or a form of another variable unstable species.

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* Except in original references, names are given under *Scenedesmus* in the masculine form *quadricaudus*, *bijugus* etc., irrespective of the use by past authors of the forms *quadricauda*, *bijuga* etc.

The following results are appended in order to try to integrate the two methods of study, viz. that of field or collection identification and that of culturing of specimens. I have tried to link serial observations in the field with results known from published results on culturing.

In the field at Braidwood, I have frequently found four or more recognized species of *Scenedesmus* in a single drop of water. Does this diversity represent merely a history of varying micro-environments undergone by members of a single polymorphic species of *Scenedesmus*, or does the occurrence of morphologically distinct forms growing in the same environment represent a series of distinct species, each of which of course may vary under differing conditions?

VARIATION IN *SCENEDESMUS* IN THE FIELD

During a recent 3-year (1968–1971) series of observations at Braidwood (May, 1972), the genus *Scenedesmus* has been observed frequently in several bodies of water. The three most common species observed were *S. bijugus*, *S. obliquus* and *S. quadricaudus*. Others recorded, but far less frequently, were *S. abundans*, *S. opoliensis*, *S. armatus* and a variety of *S. denticulatus*.

At Braidwood Lagoon *S. bijugus*, *S. obliquus* and *S. quadricaudus* occurred throughout 12 months or more and, of course, under varying conditions* (May, 1972). These species would, it seems, be the "stable species" as described by Trainor (1964, 1966). The "*longus*" (sensu Smith, see p. 86) and "CAB 2 form" (Trainor, 1964) occurred sometimes when *S. quadricaudus* was present anyway at Braidwood Lagoon).

During this time observations have been made, in these three most common species, of occasions when the usual coenobe number of four cells is either exceeded or reduced (Table 1).

There were only six occasions noted, all in the first half of the year, when the coenobe consisted of less than four cells. These occasions (Table 1A) were in January 1969 (two species), July 1969†, March 1970, April 1971 and May 1971. On thirteen occasions, scattered amongst the same three species, the coenobe consisted of more than four cells. These were (Table 1B) in January 1969, July 1969, September 1970, October 1970, November 1970 (two species), December 1970 (two species), March 1971, April 1971, May 1971 (two species) and June, 1971. These occurrences were in various months of the year, with May, November and December having records of two species showing this behaviour at the same time.

Thus conditions occurring in Braidwood Lagoon in the first half of the year favoured at times the production of less than four cells per coenobe. Coenobes with more than four cells were likely to occur throughout the year.

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* Including light, depth, temperature, bacterial and nutrient concentration, associated plants and animals, etc.

† 2nd July, 1969.

In another dam in the district—Chapman's Dam—*S. obliquus* and *S. quadricaudus* occurred from June 1970 to September 1971 and are therefore also regarded as "stable" species. Here coenobes of less than four cells were observed (in either species) on seven occasions, all in the second half of the year, in June 1970*, July 1970 (both species), September 1970, October 1970 and September 1971 (both species). (Table 1A). There were no observations of more than four cells per coenobe.

TABLES 1A AND 1B

Occurrence of coenobes of various numbers of cells in various species of *Scenedesmus* collected from Braidwood Lagoon and Chapman's Dam, Braidwood, N.S.W., during different months of the year. Table 1A shows coenobes consisting of less than 4 cells; Table 1B shows coenobes consisting of more than 4 cells.

TABLE 1A

BRAIDWOOD LAGOON, BRAIDWOOD.

MONTHS

Species of *Scenedesmus*	Cells/coenobe	January	February	March	April	May	June	July	August	September	October	November	December
S. bijugus ..	3	..	..	..	..	..	..	..	..	..	O	..	..
	2	..	..	..	..	..	..	..	..	O	O	O	O
	1	×	..	..	..	..	..	..	..	..	..	..	..
S. obliquus	3	..	..	×	..	..	..	..	..	..	..	..	..
	2	..	..	..	..	..	..	×	..	O	O	O	..
S. quadricaudus ..	3	..	..	..	..	×	..	..	..	..	..	O	..
	2	×	..	..	..	×	..	..	..	O	O	O	O
	1	×	..	..	×	..	..	..	..	..	..	..	O

CHAPMAN'S DAM, BRAIDWOOD.

MONTHS

Species of *Scenedesmus*	Cells/coenobe	January	February	March	April	May	June	July	August	September	October	November	December
S. obliquus	3	..	..	..	..	..	..	×	..	×	..	..	..
	2	..	..	..	..	..	..	×	..	×	..	..	..
S. quadricaudus ..	2	..	..	..	..	..	..	..	..	× ×	×	..	..
	1	..	..	..	..	..	×	×	..	..	..	..	..

Occurrence of coenobes consisting of less than four cells of the common species of *Scenedesmus* at two locations at Braidwood during different months of the years 1968–1972. Observations recorded before alum treatment are marked by a cross, those after alum treatment by a circle.

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* 30th June, 1970.

TABLE 1B

Braidwood Lagoon, Braidwood

Species of *Scenedesmus*	January	February	March	April	May	June	July	August	September	October	November	December
						Months						
S. bijugus	×	..	..	..	×	×	..	..	×	..	..	..
S. obliquus	..	..	..	×	..	..	..	..	..	O	× O	×
S. quadricaudus ..	O	..	×	..	×	..	×	..	..	× O	× O	×

Occurrence of coenobes consisting of more than four cells of the three common species of *Scenedesmus* at Braidwood Lagoon during different months of the years 1968–1972. Observations recorded before alum treatment are marked by a cross, those after alum treatment are marked by a circle.

It would appear that the differing local conditions in these two dams of the Braidwood district account for (1) the time of occurrence of less than four cells per coenobe being at different times of the year in the two dams, and (2) more than four cells per coenobe occurring throughout the year in one dam but not at all in the other.

It is realized that some of the uni- and bi-cellular forms observed could have resulted from damage to a coenobe originally consisting of more cells. For instance, at Braidwood Lagoon in April 1971, a 4-celled *S. quadricaudus* was observed where only one cell was still green and vital; other coenobes containing some completely empty cells were noted in May, 1971. Coenobes were frequently bumped by motile organisms, such as *Euglena* sp., when the coenobe could be twisted out of its normal single plane. Cells were sometimes damaged and occasionally were found loose. One specimen of *S. opoliensis* was found in which cells 1 and 3 were normal but cells 2 and 4 were completely void of contents. It would be likely that these cells would separate shortly. Single cells have been found in most species of *Scenedesmus* which I have found at Braidwood. Some at least of these could originate as described above. These damaged plants might account for some irregularities, but not, for instance, for a major part of the *Scenedesmus* population being two-celled coenobes, as happened at Chapman's Dam in October 1970.

Komarek & Ruzicka (1969) have shown how the size and morphology of organisms of *S. quadricaudus* vary with temperature and light. They indicate that 2-celled coenobes develop more with high temperature and low light, while 8-celled coenobes are more common when light and nutrient are supra normal

In the Braidwood district we have seen that coenobes with less than four cells occur at different times of year in nearby dams, so this occurrence does not seem linked here with either temperature or light dependant on the climate. It is possible that at Braidwood the occurrence of 8-celled coenobes reflects high nutrient values but again in this region it is not dependent on light.

So far, insufficient observations have been made on the less common species of *Scenedesmus* for any conclusions to be reached concerning their response to change in environment. These species could be either rare or else forms assumed by an unstable species.

In July 1971, 21 cwt. (1067 kg) of hydrated potassium aluminium sulphate powder was dissolved in Braidwood Lagoon (at approximately 1 lb/1,000 gals, or 1 g/10 l.) and ½ ton (508 kg) of block ferric alum was suspended in the water, and replaced at 2–3 month intervals, as it dissolved. Thus, in July 1971, there was a sudden artificial discontinuity of conditions. After this treatment, occurrences of less than 4 cells per coenobe were observed in all three common species of *Scenedesmus* in September, October and November, and in two species in December 1971 (Table 1A). It seems clear that the addition of the alums has changed the conditions at Braidwood Lagoon, so that conditions which formerly favoured the occurrence of coenobes consisting of less than four cells only in the first half of the year now favour the occurrence of such coenobes in the second half. Again, the occurrence of coenobes with less than four cells does not seem to be linked with climatic conditions of temperature or light.

After the alum treatment, 8-celled coenobes occurred as before (Table 1B).

SYSTEMATIC TREATMENT

KEY TO SPECIES OF *SCENEDESMUS* IN AUSTRALIA

1. No appendages, horns or ridges on cells.
  2. Cell apices acute.
    3. Without swollen ends on cells.
      4. Cells regularly arranged .... *S. obliquus* 1.
      4.* Cells of coenobe irregular in arrangement .... *S. bernardii* 2.
    3.* With swollen ends on cells.
      5. Apices of outer cells pointing outwards .... *S. antennatus* 3.
      5.* Apices of outer cells pointing inwards .... *S. incrassulatus* 4.
  2.* Cell apices obtuse .... *S. bijugus* 5.

1.* With teeth, ridges or horns on cells or with ridges along individual cells.
  6. With ridges along individual cells.
    7. Without spines or teeth .... *S. acutiformis* 6.
    7.* With spines or teeth.
      8. Teeth present on all poles.
        9. Without long spines on marginal cells .... *S. brasiliensis* 7.
        9.* With long spines on marginal cells .... *S. carinatus* 8.
      8.* Teeth replaced by spines on marginal cells .... *S. armatus* 9.

6.* Without ridges along individual cells.
    10. Individual cells toothed ....*S. denticulatus* 10.
    10.* Individual cells not toothed, but marginal cells bear spines (horns). With or without other appendages.
        11. With additional spines on central parts of walls of marginal cells .... *S. abundans* 11.
        11.* Without additional spines on central parts of walls of marginal cells.
            12. Cells of coenobe joined for most of their length *S. quadricaudus* 12.
            12.* Cells of coenobe separate for most of their length.
                13. Cells joined only in median third of their length *S. opoliensis* 13.
                13.* Cells joined only by polar processes, so that interstices are formed between the cells ....*S. perforatus* 14.

1. Scenedesmus obliquus (*Turp.*) *Kuetzing* (1833) 609; Smith (1916) 428, Pl. XXV, fig. 7, Pl. XXIX, figs. 63–68.

SYNONYMY: *Achnanthes obliqua* Turpin (1820) fig. 9.

Coenobe planar, usually consisting of 2, 4 or 8 cells, arranged regularly either in a linear or an alternating series. *Cells* usually all erect; walls smooth, lacking spines, teeth, granulations, lateral ridges or polar thickenings; apices acute.

Under this species I am including *S. dimorphus* (Turp.) Kuetz. These two supposed species differ in that the outer or marginal cells usually curve outwards in *S. dimorphus* but are erect in *S. obliquus*. Many workers have regarded these forms as belonging to a single species. Smith (1916) regarded the two forms as distinct species, although he (*loc. cit.* p. 435) remarks about *S. dimorphus* that "Certain of the largest colonies in the culture, however, do not show this curving as well, but resemble *S. obliquus*". I have found plants (Braidwood Lagoon, 29.9.1971) showing one form at one end, the other at the other end, of the coenobe. The difference being so unreliable, it seems wiser to consider these two forms as being one species, regarding the extreme curved forms as a variety only, viz. *S. obliquus* var. *dimorphus* Hansgirg.

KEY TO VARIETIES

1. Outer cells of coenobe erect ....var. *obliquus* a.
1.* Outer cells of coenobe with apices pointing outwards ....var. *dimorphus* b.

a. S. obliquus var. **obliquus.**

RECORDS CITED: NEW SOUTH WALES: Casino; Lismore; Richmond River (Playfair 1916, as *S. securiformis* Playfair*). Braidwood Lagoon, Braidwood, V. May 101, 11.1970 (both varieties occurred here and at Chapman's Dam, Braidwood, throughout the year). Tanks, Broken Hill (Moewus 1953, as *S. acutus* (Meyen) Chodat†). VICTORIA: Cheltenham; Fernshaw (Hardy 1906). Yan Yean (West 1909). Melbourne (Hardy 1913). QUEENSLAND: Sandgate Lagoon (Bailey 1913).

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* *S. securiformis* Playfair (1916) was included by Chodat (1926) in the *obliquus* complex. I regard it as a synonym of *S. obliquus*, from which I consider the plants in Playfair's illustrations indistinguishable.

† Included (Smith 1916, p. 430) in *S. obliquus*.

b. **S. obliquus** var. **dimorphus** *Hansgirg.**

RECORDS CITED: NEW SOUTH WALES: Lismore (Playfair drawing No. 2 (NSW), no bottle number or date, as *S. obliquus* var. *dimorphus* (Turp.) Rabenh.). Sydney district (Playfair 1913, 1917, as *S. obliquus* var. *acuminatus* (Lagerh.) Chod.†). NORTHERN TERRITORY: Oenpelli; Yirrkalla (Scott & Prescott 1958, as *S. dimorphus*).

UNACCEPTABLE RECORDS: Recorded as *S. obliquus* var. *inermis* Playfair (see *S. bijugus*, p. 442). Recorded as *S. obliquus* var. *antennatus* (Bréb.) Playfair (see *S. antennatus* p. 439).

2. **Scenedesmus bernardii** *Smith* (1916) 436, Pl. XXV, fig. 6, Pl. XXXIII, figs. 196–208.

SYNONYMY: *Scenedesmus obliquus* forma *magnus* Bernard (1908) 182, fig. 420.

As *S. obliquus*, but with the cells of the coenobe arranged irregularly and with the terminal cells often in a different plane from others in the coenobe. Doubtfully different from *S. obliquus*.

RECORDS CITED: NORTHERN TERRITORY: Yirrkalla (Scott & Prescott 1958).

3. **Scenedesmus antennatus** *de Brébisson* in Ralfs (1848) 222, Pl. XXXV, figs. 27A–27B. Smith (1916) 439, Pl. XXVIII, figs 56, 58.

As *S. obliquus*, but with swollen ends or globules occurring on the apices of the cells, and with the terminal cells always curved outwards.

RECORDS CITED: NEW SOUTH WALES: Lismore (Playfair drawing No. 3 (NSW), no bottle number or date). Botany Water Reserves, Sydney district (Playfair 1923). N.S.W. Playfair 1917, as *S. obliquus* var. *antennatus* (Bréb.) Playfair).

4. **Scenedesmus incrassulatus** *Bohlin* (1897) 24, Pl. I, figs. 45–51. Smith (1916) 440, Pl. XXV, figs. 9–10.

As *S. obliquus*, but with swollen ends or globules occurring on the apices of the cells, and with the terminal cells never curved outwards.

RECORDS CITED: NEW SOUTH WALES: Centennial Park, Sydney; Botany (Playfair 1923). Playfair drawing No. 21 (NSW) also from these localities, no bottle number or date.

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* *Achnanthes dimorpha* Turpin (1820) fig. 2. *Scenedesmus dimorphus* (Turp.) Kuetzing (1833) 608. Smith (1916) 434, Pl. XXV, fig. 8, Pl. XXXII, figs. 185–189, Pl. XXXIII, figs. 190–195. *Scenedesmus obliquus* var. *dimorphus* Hansgirg (1886) 116.

As type variety, but most coenobes showing outer cells with apices pointing outwards.

† *S. obliquus* var. *acuminatus* (Lagerh.) Chod. was recorded from the Sydney district by Playfair (1913) but was treated as *S. acuminatus* (Lagerh.) Chod. by him in 1917 and also by Smith (1916). However, notes by Playfair (NSW) state that in his sense *S. obliquus* var. *acuminatus* "Apparently . . . is **not** *Selenastrum acuminatum* Lagerheim, as G.S. West has noted and figured the latter. Rather doubtfully distinct from v. *dimorphus*". From these notes, together with Playfair's drawing No. 22 labelled "*S. obliquus* v. *acuminatus* (Chodat) mihi", from Botany (no bottle number or date), which shows the coenobe in one plane, unlike Chodat's plant, I am including *S. acuminatus* Playfair under *S. obliquus* var. *dimorphus*.

5. **Scenedesmus bijugus** (*Turp.*) *Kuetzing* (1833) 607 (as *S. bijugatus*).*

SYNONYMY: *Achnanthes bijuga* Turpin (1828) 310, Pl. XIII, fig. 4. *Scenedesmus bijugus* (Turp.) Lagerheim (1893) 158 (as *S. bijuga*). Smith (1916) 441, Pl. XXV, fig. 2 (as *S. bijuga*).

Coenobe planar or curved, usually consisting of 2, 4, 8 or 16 upright cells arranged regularly either in a linear or an alternating or a double series. *Walls* of cells smooth, lacking spines, teeth, granulations, lateral ridges or polar thickenings; apices not acute.

In this species I am including *S. arcuatus* Lemm. There has been much confusion over the limits of these species, certain forms of which are, in my opinion, indistinguishable from each other. In both species individuals may consist of 8 cells. Smith (1916, p. 450) regards the arrangement of the cells of an 8-celled coenobe as being a specific character separating *S. arcuatus* from *S. bijugus;* in the former the cells are superimposed while in the latter they occur in a linear or sub-alternate series. A further difference is that in *S. arcuatus* the cells are generally arranged on a curved surface, but this is not so in *S. bijugus.* Var. *platydiscus* (Smith, *loc. cit.* p. 451) combines the flat surface arrangement of *S. bijugus* with the double series of cells of *S. arcuatus.* Smith considers that this variety belongs with *S. arcuatus. S. bijugus* var. *irregularis* (Wille) Smith is described as being usually 8-celled and having an irregular double series of cells. When illustrations of these very similar forms of the two species are examined (e.g. Smith figs. 59–62 and 101–105) it seems impossible to obtain a satisfactory separation of the two species, which I am therefore regarding as *S. bijugus*, including its variety *S. bijugus* var. *arcuatus.* Smith (1916, p. 484) states that *S. bijugus* var. *disciformis* Chod., a form previously reported from New South Wales, could be *S. bijugus* var. *irregularis* or *S. arcuatus* var. *platydiscus*, again emphasizing the extreme difficulty in drawing a satisfactory species distinction within *S. bijugus.*

KEY TO VARIETIES

1. Coenobe frequently with inner cells at right angles to others ....var. *obtusiusculus* a.
1.* Coenobe without inner cells at right angles to others.
  2. Pairs of cells of coenobe superimposed vertically ....var. *duplex* b.
  2.* Pairs of cells of coenobe not superimposed vertically.
    3. Coenobe usually of 8 cells in 2 series, the upper series of 4 cells being arranged immediately above the lower series. Cells sometimes on a curved surface .... var. *arcuatus* c.
    3.* Cells of coenobe in linear or alternate series, never in a superimposed double series; cells not on curved surface.
      4. Cells separated by a wide space; cells in each row separated by approximately twice the width of the individual cell ....var. *ralfsii* d.
      4.* Cells moderately close; cells in each row not separated by more than a cell width.
        5. Cells equal-sized ....var. *bijugus* e.
        5.* Outer cells of coenobe smaller ....var. *inermis* f.

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* Although the specific epithet is given by Kuetzing (*loc. cit.*) as "*bijugatus*", this is considered to be an orthographic variant, and Kuetzing is accepted as the author of the combination.

a. **S. bijugus** var. **obtusiusculus** (*Chod.*) *Smith.**

Records Cited: New South Wales: Botany Water Reserve; Fairfield (Playfair 1923, as *S. bijugus* var. *irregularis* Playfair†).

b. **S. bijugus** var. **duplex** *Playfair.*‡

Records Cited: New South Wales: Fairfield (Playfair 1923).

c. **S. bijugus** var. **arcuatus** *Lemm.*§

Records Cited: New South Wales: Lismore; Botany Water Reserve; Fairfield (Playfair 1923, as *S. bijugatus* var. *disciformis* Chod.||). Botany Water Reserve; Fairfield (Playfair 1923).

d. **S. bijugus** var. **ralfsii** (*Playfair*) *May*, **comb. et stat. nov.**¶

Basionym: *S. ralfsii* Playfair in Proc. Linn. Soc. N.S.W. XLVIII (1923) 221.

Differing from other forms of the species in that the cells in each row are separated by a distance twice the width of the individual cell.

Records Cited: New South Wales: Collector, near Lake George (Playfair 1923).

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* *Scenedesmus obtusiusculus* Chodat (1913) 47, figs. 24–34. Chodat (1926) 177–179, fig. 70. *Scenedesmus bijugus* var. *obtusiusculus* (Chod.) Smith (1916) 447 (as *S. bijuga* var. *obtusiusculus*).

As type variety, but with inner cells arranged irregularly, sometimes at right angles to marginal cells.

† The name *S. bijugus* var. *irregularis* (Wille) Smith is already occupied (Smith 1916). Playfair's variety (Playfair 1923, p. 220–221) was not illustrated, nor associated with a type specimen in the original description, but is represented in NSW by his drawing No. 19 labelled "*Scenedesmus bijugus* v. *irregularis* n. var. ms." from Botany, N.S.W. From the description, and after an examination of this drawing of this variety (no bottle number or date), it seems to me to accord with Chodat's polymorphic *S. obtusiusculus* (Chodat 1926, p. 178, fig. 70). This atter species Smith (1916) treats as *S. bijugus* var. *obtusiusculus* (Chod.) Smith, which I think s the correct name for var. *irregularis* Playfair.

‡ *Scenedesmus bijugus* var. *duplex* Playfair (1923) 220.

As type variety, but with pairs of cells of coenobe superimposed vertically.

§ *Scenedesmus bijugus* var. *arcuatus* Lemmermann (1898) 159 (as *S. bijugatus* var. *arcuatus*). *Scenedesmus arcuatus* (Lemmermann) Lemmermann (1899) 112, Pl. 1, fig. 2–4. Smith (1916) 449, Pl. XXVI, figs. 19–20, Pl. XXIX, figs. 94–98, Pl. XXX, figs. 99–100.

As type variety, but with cells of coenobe in two different series, not being arranged linearly or alternately.

|| Possibly Playfair's drawing No. 17, labelled by him as "*S. bijugus* v. *obtusus* (Meyen) mihi", with synonyms including "*S. bijugatus* v. *disciformis* Chod." and *S. arcuatus* Lemm., forms part of the basis for the record of "*S. bijugatus* var. *disciformis*" Chod. in Playfair (1923), in which case the variety would be *S. arcuatus* var. *platydiscus* Smith. This variety differs from typical *S. arcuatus* primarily in lacking the curve of the coenobe; Playfair (1923), discussing var. *arcuatus*, notes the variability of this character. Hence I think the record should be included under *S. bijugus* var. *arcuatus*.

¶ *S. ralfsii* was described by Playfair (1923) from Collector, N.S.W., together with "Syn. *S. obtusus* Ralfs (non Meyen) Brit. Desm. T. 31 f. 16". The description by Playfair indicates the distinction between these two species to be that *S. ralfsii* has "ovate cells" which are rounded at one end and acuminate at the other, and separated by a considerable space. There is no illustration. Playfair's drawing No. 18 under the name "*S. bijugus* v. *Ralfsii* nom. nov. author's ms"—no loc., date or bottle no.—shows eight obtuse-ended cells, well separated, together with the wording "Syn. *Sc. obtusus* Ralfs—not Meyen" and the statement "Cells separated, in two rows, oval or ovate, apparently held together by mucus. I have only seen it once". The drawing shows that the taxon is allied to *S. bijugus* var. *bijugus*, from which it differs mainly in the wide separation of the cells. The cells in each row are separated by a distance approximately twice the width of the individual cell. I therefore reduce this taxon *S. ralfsii* to varietal rank. It was considered by Chodat (1926, p. 166) to be a species allied to *S. bijugus*.

e. **S. bijugus** var. **bijugus.**

Records Cited: Queensland: Queensland (Bailey 1913, as *S. bijugus* (Turp.) Kuetz.). New South Wales: Sydney district (Playfair 1913, as *S. obliquus* var. *inermis* Playfair; 1917, as *S. acuminatus* var. *inermis* Playfair).* Botany Water Reserve (Playfair 1923, as *S. curvatus* Bohlin†). Braidwood Lagoon, Braidwood, V. May bottle 201B and sheet B82, 9.1970 (found throughout the year. Variation in size of coenobe was shown particularly in collections made on 29.9.1971). Victoria: Yan Yean (West 1909, as *S. bijugatus* (Turp.) Kuetz.). Heidelberg (Hardy 1906, as *S. bijugatus* (Turp.) Kuetz.). Melbourne (Hardy 1913, as *S. bijugatus* (Turp.) Kuetz.).

f. **S. bijugus** var. **inermis** (*Playfair*) *May*, **comb. et stat. nov.**‡

Basionym: *S. quadricaudus* var. *inermis* Playfair in Proc. Linn. Soc. N.S.W. XLI (1916) 835 (as *S. quadricauda* var. *inermis*).

As type variety, but with outer cells of coenobe smaller than central ones.

Records Cited: Queensland: Enoggera (Playfair 1916, as *S. quadricaudus* var. *inermis* Playfair). New South Wales: Lismore; Botany (Playfair 1916, as *S. quadricaudus* var. *inermis* Playfair).

6. **Scenedesmus acutiformis** *Schröder* (1897) 45, Pl. II, fig. 4; Smith (1916) 456, Pl. XXVI, figs. 28–29, Pl. XXIX, figs. 84–89.

Coenobe consisting of 2 to 8 upright cells, each of which bears at least one longitudinal ridge (the median cells bear only a single ridge on each side). *Spines* and teeth absent. *Apices* of cells acute.

This species may be allied to *S. armatus*.

Records Cited: New South Wales: Botany (Playfair drawing No. 9 (NSW), no bottle number or date, as *S. hystrix* var. *acutiformis* (Schröder) Chodat). Victoria: Cheltenham (Hardy 1906). Yan Yean (West 1909).

7. **Scenedesmus brasiliensis** *Bohlin* (1897) 22, Pl. I, figs. 36–37; Smith (1916) 458, Pl. XXVI, figs. 30–31.

Coenobe usually consisting of 4 to 8 upright cells arranged regularly. *Walls* of cells each bearing longitudinal ridges. *Teeth* present at all the cell apices (poles). *Spines* absent: cells obtuse.

This species may be allied to either *S. armatus* or *S. denticulatus*.

Records Cited: Northern Territory: Oenpelli (Scott & Prescott 1958). Queensland: Barron River (Bailey 1913). New South Wales: Lismore (Playfair drawing No. 12 (NSW), no bottle number or date, as *S. hystrix* var. *brasiliensis* (Bohlin) Chodat. Plants are shown both with and without ridges).

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* Of this record by Playfair of *S. obliquus* var. *inermis*, Smith (1916, p. 488) says "It is impossible to determine just what alga it is". Possibly it belonged to the *bijugus* complex.

† *S. curvatus* Bohlin was recorded by Playfair (1923, p. 221), from the Sydney district, N.S.W. Notes by Playfair attached to his drawing of No. 20, labelled *S. curvatus* Bohlin, from Botany (no date or bottle no.) states that "There does not however appear to be any curvature in our forms, and it is probably not characteristic", and that this "should probably be arranged as a variation of *S. bijugus*". These drawings, of both 4- and 8-celled coenobes, seem to represent *S. bijugus* var. *bijugus* and I therefore include *S. curvatus* Playfair as a synonym of *S. bijugus*.

‡ This variety of Playfair's seems to be much better placed with *S. bijugus* than with the spine-bearing species *S. quadricaudus*.

8. Scenedesmus carinatus (*Lemm.*) *Chod.* (1913) 23, 69; Smith (1916) 462, Pl. XXXVI, fig. 25.

Synonymy: *Scenedesmus opoliensis* var. *carinatus* Lemmermann (1899) 113, Pl. 1, fig. 7.

Coenobe consisting of 4 upright cells. *Walls* of cells each with longitudinal ridges. *Teeth* present on the apices of all cells, also spines occurring on both apices of each marginal cell.

This species may be allied to *S. armatus* or perhaps to *S. quadricaudus*.

Records Cited: Northern Territory: Arnhem; Oenpelli (Scott & Prescott 1958).

9. Scenedesmus armatus (*Chod.*) *Smith* (1916) 460, Pl. XXVIII, fig. 53, Pl. XXIX, figs. 90–93, Pl. XXX, figs. 109–110.

Synonymy: *Scenedesmus hystrix* var. *armatus* Chodat (1902) 215, fig. 140.

Coenobe consisting of 2 to 8 upright cells. *Walls* of cells bearing longitudinal ridges which may be incomplete. *Teeth* lacking but spines present on the apices of the marginal cells.

This species was found in small numbers in Braidwood Lagoon, Braidwood, 15.5.1971. Later (September, October, 1971) plants were found suggesting *S. quadricaudus* but bearing a ridge down one cell only; these, of course, may have been damaged plants but could well be indicative of this being an "unstable species" here (*sensu* Trainor 1964, 1966). Smith (1916, p. 461) also reports variability in the presence of ridges on cells within a coenobe. This species was well represented in Braidwood Lagoon on 29.9.1971.

Records Cited: Queensland: Enoggera (Playfair 1916, as *S. denticulatus* var. *opoliensis* (Richter) Playfair*). New South Wales: "Found here" (Playfair 1916, as *S. hystrix* var. *armatus* Chod.). Botany (Playfair drawing No. 10 (NSW), no bottle number or date as *S. hystrix* var. *armatus* Chod.). Botany (Playfair drawing No. 15 (NSW), no bottle number or date, as *S. denticulatus* var. *opoliensis* (Richter) Playfair). Botany; Parramatta (Playfair 1916, as *S. denticulatus* var. *opoliensis* (Richter) Playfair*). Braidwood Lagoon, Braidwood, V. May bottle C 101, 9.1971.

10. Scenedesmus denticulatus *Lagerheim* (1883) 61, Pl. II, figs. 13–17; Smith (1916) 452, Pl. XXVI, fig. 23.

Coenobe consisting of 4 upright cells arranged either in a linear or an alternating series. *Walls* of cells bearing teeth at their apices. *Spines* absent. *Apices* not acute.

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* Playfair's drawing No. 15 quoted above, shows a 2-cell coenobe with both ridges and spines. On this drawing is written "Coenob (2 cell) s. sp. 8 × 12μ. 12 × 15μ. Spines long 6–10μ", the description given under the varietal name *S. denticulatus* var. *opoliensis* (Richter) (Playfair, 1916, p. 835). The synonymy quoted is also the same. There is also on the drawing the note: "A form of *Sc. denticulatus* with the long terminal spines of *Sc. quadricauda*". I feel sure that this is the form to which the records given in Playfair (1916, p. 835) refer, and therefore state their location as above.

KEY TO VARIETIES

1. Teeth reduced to a single point at each end of cell ....var. *brevispinus* a.

1.* More than one tooth at each end of cell.
  2. Cells long and narrow, approximately four times as long as broad ....var. *gracilis* b.
  2.* Cells not long and narrow, less than four times as long as broad.
    3. Usually bearing 3 teeth at each end of cell ....var. *lunatus* c.
    3.* Usually bearing 2 teeth at each end of cell.
      4. Cells arranged in linear series; cell width to 5 μm ....var. *linearis* d.
      4.* Cells arranged either in alternate or linear series; cell width to 10 μm .... var. *denticulatus* e.

a. **S. denticulatus** var. **brevispinus** (*Smith*) *May*, **comb. et stat. nov.***

BASIONYM: *S. longus* var. *brevispinus* Smith in Trans. Wisconsin Acad. Sci. XVIII (1916) 471, Pl. XXXI, fig. 152 (as *S. longus* var. *brevispina*).

As type variety, but with teeth reduced to a single point at each end of cell.

RECORDS CITED: NEW SOUTH WALES: Narrabeen, in soil, dried bed of pool (illustrated in Melvaine, University of Sydney M.Sc. Thesis, 1940, as *S. denticulatus* var. *australis* Playfair). Collector, near Lake George (Playfair 1916 as *S. denticulatus* var. *australis* Playfair). Braidwood Lagoon, Braidwood, V. May bottle C101, 9.1971.

b. **S. denticulatus** var. **gracilis** *Playfair*.†

RECORDS CITED: NEW SOUTH WALES: Lismore; Centennial Park; Guilford; Botany (Playfair 1916).

c. **S. denticulatus** var. **lunatus** *W. West & G.S. West*.‡

RECORDS CITED: NEW SOUTH WALES: Botany (Playfair drawing No. 14 (NSW), no bottle number or date).

d. **S. denticulatus** var. **linearis** *Hangsgirg*.§

RECORDS CITED: QUEENSLAND: Nundah (Bailey 1913). NEW SOUTH WALES: N.S.W. (Playfair 1917). Centennial Park; Botany (Playfair drawing No. 13 (NSW), no bottle number or date). VICTORIA: Yarra Lagoon (Hardy 1906). Yan Yean (West 1909).

UNACCEPTABLE RECORDS: Recorded as *S. denticulatus* var. *opoliensis* (Richter) Playfair (see *S. armatus*, p. 443).

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* Smith (loc. cit.) included his new variety under *S. longus* since the "spines are not broad at base"; however, in this character it does not differ from var. *lunatus* as illustrated by Smith (*loc. cit.* Pl. XXVI, fig. 24). Chodat (1926, p. 187) raised this variety to specific rank, *S. brevispinus* (Smith) Chod. (as *S. brevispina*) and included it in his group of species associated with *S. denticulatus* Lagerh. Playfair (1916) described a new variety as *S. denticulatus* var. *australis* from Collector, N.S.W. This variety is, I think, the same as Smith's *S. longus* var. *brevispinus*, and should be included among the range of forms of *S. denticulatus*.

Smith (1916, p. 444) records apparent *S. bijugus* bearing small spines on the ends of the cells; this report is suggestive of the present variety.

† *Scenedesmus denticulatus* var. *gracilis* Playfair (1916) 835. Pl. LVII, fig. 14.

As type variety but cells about four times as long as broad.

‡ *Scenedesmus denticulatus* var. *lunatus* W. West & G.S. West (1895) 82, Pl. V, figs. 11–12; Smith (1916) 455, Pl. XXVI, fig. 24.

As type variety but usually bearing 3, not 2, teeth at each end of cell. Playfair's drawing is a doubtful record as it shows 2 teeth, not 3, as is usual in this variety.

§ *Scenedesmus denticulatus* var. *linearis* Hansgirg (1886) 268; Smith (1916) 454.

As type variety but cells arranged always in a linear series and cell width less than 5 μm.

11. Scenedesmus abundans (*Kirchner*) *Chodat* (1913) 77; Smith (1916) 465, Pl. XXX, figs. 133–136, Pl. XXXI, figs. 137–140.

SYNONYMY: *Scenedesmus caudatus* forma *abundans* Kirchner, 1878, 98.

Coenobe of 2 to 4 erect cells. *Spines* always present on the apices of the marginal cells; additional spines on the middle part of the walls of these cells. *Additional* spines or horns sometimes present near the apices of any of the cells. *Apices* of cells not acute.

Specimens of this species were found at Braidwood Lagoon, from December 1970 to September 1971. These plants resemble *S. quadricaudus* but show an additional spine or spines on the middle part of the walls of the terminal cells.

This is a new record of the species for Australia.

RECORDS CITED: NEW SOUTH WALES: Braidwood Lagoon, Braidwood, V. May A150, 3.1971.

12. Scenedesmus quadricaudus (*Turp.*) *de Brébisson* (1835) 66 (as *S. quadricauda*); Smith (1916) 473, Pl. XXXVII, fig. 39, Pl. XXXI, figs. 172–175, Pl. XXXII, fig. 176, (as *S. quadricauda*).

SYNONYMY: *Achanthes quadricauda* Turpin (1820), fig. 13. "*Scenedesmus longus* Meyen" sensu Smith (1916) 469, Pl. XXVIII, fig. 54, Pl. XXXI, figs. 156–158.*

Coenobe of 2 to 8 upright cells arranged in linear or alternate series. *Spines* present at apices, but not elsewhere, of the marginal cells; sometimes present on apices of non-marginal cells. *Adjacent cells* in lateral contact for most of their length. *Apices* of cells not acute.

KEY TO VARIETIES

1. Spines curved inwards .... var. *incurvus* a.
1.* Spines usually divergent. Cells flattened at apex
  2. Spines short, approximately half length of cell. .... var. *quadrispinus* b.
  2.* Spines long, approximately the length of cell. .... var. *quadricaudus* c.

a. **S. quadricaudus** var. **incurvus** *Playfair*.†

RECORDS CITED: NEW SOUTH WALES: Centennial Park, Sydney (Playfair 1916).

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* Smith (1916) used the name *S. longus* for a *Scenedesmus* similar to *S. quadricaudus*, but bearing spines on the interior cells. Chodat (1926, p. 246) pointed out that the original reference by Meyen, quoted by Smith, did not in fact mention these additional spines, so that Smith's material was not necessarily *S. longus* Meyen and Chodat called this material "*S. longus* Smith". However, the series of illustrations by Chodat (1926) of units within the *quadricaudus* complex suggests that Smith's material should be included in *S. quadricaudus* (Turp.) Bréb., and it is so treated here.

† *Scenedesmus quadricaudus* var. *incurvus* Playfair (1916) 834, Pl. LVII, fig. 11 (as *S. quadricauda* var. *incurvus*).

As type variety but with the spines from a terminal cell curving towards each other.

b. **S. quadricaudus** var. **quadrispinus** (*Chod.*) *Smith.**

RECORDS CITED: NORTHERN TERRITORY: Bickerton Island (Scott & Prescott 1958).

c. **S. quadricaudus** var. **quadricaudus.**

RECORDS CITED: NORTHERN TERRITORY: Yirrkalla (Scott & Prescott 1958). Bickerton Island (Scott & Prescott 1958, as *S. longus*†). QUEENSLAND: Queensland (Bailey 1913). Enoggera Reservoir (Bailey 1913, reported as *S. brasiliensis* Bohlin var. *horridus* Kirchn. illustrated (Fig. 937) as *S. quadricaudus* Bréb. var. *horridus* Kirchn.‡). NEW SOUTH WALES:, Chapman's Dam, Braidwood, V. May bottle C150, 10.1970; Braidwood Lagoon, Braidwood, V. May bottle C101, 9.1971. Found throughout the year by the author, both at Braidwood Lagoon and at Chapman's Dam, Braidwood. Specimens bearing additional spines in the central cells (as Smith described "*S. longus*") were seen at the Lagoon in May and September 1971. Specimens appearing like Trainor's (1964) strain CAB 2 were also seen there in May and September 1971§. Both of these and the normal var. *quadricaudus*, with variation in size of coenobe, are present in the cited example C101. VICTORIA: Fernshaw (Hardy 1906). Yan Yean (West 1909). Melbourne (Hardy 1913).

UNACCEPTABLE RECORDS: Recorded as *S. quadricaudus* var. *inermis* Playfair (see *S. bijugus*, p. 442).

13. Scenedesmus opoliensis *Richter* (1896) 7, figs. A–E. Smith (1916) 481, Pl. XXVII, fig. 49, Pl. XXXII, figs. 181–184.

Coenobe of 2 to 4 cells in linear arrangement. *Spines* present on most or all apices of marginal cells, and sometimes of interior cells also. *Adjacent* cell walls in contact for only about $\frac{1}{3}$ of their length.

According to Smith (1916, p. 427–8) this species differs from *S. quadricaudus* mainly in the smaller proportion of adjoining wall between adjacent cells of the coenobe; it may be allied to this species or to either *S. carinatus* or *S. armatus*.

This species, as *S. quadricaudus* (Turp.) Bréb. var. *opoliensis* (Richter) W. West & G.S. West, was recorded by Playfair (1916 and 1917) as occurring in New South Wales. However, Playfair's drawing No. 15 of a *Scenedesmus* from Botany, N.S.W., labelled "*S. denticulatus* v. *opoliensis* (Richter) mihi ms." shows a 2-celled coenobe bearing terminal spines, with longitudinal ridges on each cell, typical of *S. armatus*. It seems likely that this drawing illustrates plants which represent the basis of the records (Playfair 1916) of *S. denticulatus* var. *opoliensis* from Botany, Parramatta and Enoggera, where the synonymy given includes *S. opoliensis* Richter and *S. quadricaudus* var. *opoliensis* (Richter) W. West & G.S. West. Thus all these records seem to refer to *S. armatus* (*q.v.* p. 443).

However, collections at Braidwood have confirmed that *S. opoliensis*, agreeing with Smith's (1916) description, does occur in Australia, associated with definite specimens of *S. quadricaudus*.

RECORDS CITED: NEW SOUTH WALES: Chapman's Dam, Braidwood, V. May bottle C150, 10.1970.

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* *Scenedesmus quadricaudus* var. *quadrispinus* (Chodat) Smith (1916) 479, Pl. XXVII, fig. 43, Pl. XXXI, fig. 167–170 (as *S. quadricauda* var. *quadrispina*). Based on *Scenedesmus quadrispinus* Chodat (1913) 58, fig. 45–52 (as *S. quadrispina*).

As type variety but spines only about half the length of each cell.

† The illustration is in accord with Smith's material of "*S. longus*". See footnote p. 445.

‡ The illustration shows the form of *S. quadricaudus* which was described by Smith under the name "*S. longus*". See footnote p. 445.

§ Trainor (1964) showed that the material to which he referred as *S. longus* can be stable when cultured, as also can his strain CAB 2.

14. Scenedesmus perforatus *Lemmermann* (1904) 159; Smith (1916) 483, Pl. XXVII, Fig. 47.

Coenobe usually of 8 erect cells. *Spines* present at apices of marginal cells. *Cells* joined only near apices, so that interstices occur between the adjacent cell walls. This species may be related to *S. quadricaudus.*

RECORDS CITED: NORTHERN TERRITORY: Oenpelli (Scott & Prescott 1958).

SPECIES INCOGNITA

S. reniformis *Playfair* (1923) 221.

This species, judging from Playfair's description, differs from *S. bijugus* mainly in that the individual cells are reniform rather than oblong to ovate.

In describing this species, Playfair (*loc. cit.* p. 221) remarked: "A family of eight coenobia observed. A very rare type". The sample bottle which he quoted as "Playfair Lismore No. 327", is available in NSW. I have examined this and have been unable to find any material matching Playfair's description of *S. reniformis.* Perhaps, of course, this is because the chances of seeing a single batch of eight cells in a tube of material is minute. However, the only species of *Scenedesmus* I could find were rather rare 8-celled specimens of *S. bijugus* matching Smith's illustration (1916, Pl. 30, fig. 101) labelled *S. arcuatus* var. *platydiscus* (as *S. arcuatus* var. *platydisca*) treated in the present paper as *S. bijugus* var. *arcuatus.* I think it preferable to treat *S. reniformis* Playfair as a species on which there is insufficient information.

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New Taxa and Combinations in *Eucalyptus*—III

L.A.S. JOHNSON AND D.F. BLAXELL

SUMMARY

The following combinations are published: *E. peltata* ssp. *leichhardtii*, *E. approximans* ssp. *codonocarpa*, *E. spathulata* ssp. *grandiflora*, *E. eremophila* ssp. *pterocarpa*. The new name *E. pyrocarpa* is published for the taxon *E. pilularis* var. *pyriformis*. A new species, *E. kartzoffiana*, is described. The latter two taxa occur in New South Wales.

CCA:AB **Eucalyptus peltata** *Benth.* ssp. **leichhardtii** (*F.M. Bailey*) *L. Johnson et D. Blaxell* **comb. et stat. nov.**

BASIONYM: *Eucalyptus leichhardtii* F.M. Bailey in Queensl. Agric. J. XVI (1906) 493.

HOLOTYPE: Near Alice, Central Railway, Queensland, W. Pagan (BRI). Not seen.

ISOTYPE: NSW 132569 (NSW).

DISTRIBUTION: Queensland: from around Mt Garnet in the north to the Springsure district in the south. Blackdown Tableland and other relatively southeastern populations probably constitute another taxon.

This subspecies, with glabrous, narrow-lanceolate, non-peltate adult foliage, grows in open woodlands and appears to be more widespread than ssp. *peltata* which occurs only in the Einasleigh and Upper Burdekin River areas. Some intergradation does occur in the north where the two subspecies overlap.

MAKIKC **Eucalyptus approximans** *Maiden* ssp. **codonocarpa** (*Blakely et McKie*) *L. Johnson et D. Blaxell*, **comb. et stat. nov.**

BASIONYM: *Eucalyptus codonocarpa* Blakely et McKie in Proc. Linn. Soc. N.S.W. LV (1930) 589.

HOLOTYPE: Pheasant Mountain, 2 miles NE. of Backwater, Guyra district, New South Wales, E.N. McKie, T. Youman and W.F. Blakely NSW 19456, 10.1929 (NSW).

DISTRIBUTION: Northern Tablelands of New South Wales: known only from two localities; the type locality and Warra State Forest, c. 25 miles (40 km) SE. of Glen Innes. In both areas this taxon grows on exposed granite outcrops at elevations above 1200 m.

This subspecies does not appear to intergrade with MAKIKA ssp. *approximans* or with MAKIKB, the unnamed Macpherson Range subspecies, but specimens from Mt Norman (near Wallangarra), Queensland, exhibit certain features of both the named subspecies. The unnamed subspecies will be dealt with in a later paper.

SIDCDB **Eucalyptus spathulata** *Hook.* ssp. **grandiflora** (*Benth.*) *L. Johnson et D. Blaxell* **stat. nov.**

BASIONYM: *Eucalyptus spathulata* Hook. var. *grandiflora* Benth., Fl. Austral. III (1866) 236.

HOLOTYPE: Phillips Range, Western Australia, Maxwell (K).

ISOTYPE: NSW 132572 (NSW).

DISTRIBUTION: Western Australia: from Lake Grace and Lake King south towards Albany in the west and Ravensthorpe in the east, occurring chiefly on level country of gravelly or loamy soils. It abuts the area of ssp. *spathulata* in the north about Lake Grace.

SIDCHB **Eucalyptus eremophila** (*Diels*) *Maiden* ssp. **pterocarpa** (*Blakely et Steedman*) *L. Johnson et D. Blaxell*, **stat. nov.**

Basionym: *Eucalyptus eremophila* (Diels) Maiden var. *pterocarpa* Blakely et Steedman in Contrib. Nat. Herb. N.S.W. I (1939) 36.

Holotype: near Hatters Hill, Ravensthorpe district, Western Australia, H. Steedman NSW 58877, 1.1938 (NSW).

Distribution: Western Australia: known only from hills with outcrops of greenstone (Archaean basic metasediments and meta-igneous rocks) in the Ravensthorpe district and northward. We have seen material of the extreme form only from the type locality (now Hatter Hill) which is about 80 km north of Ravensthorpe. From Mt Short (16 km N. of Ravensthorpe) and "140 mile peg, Rabbit Proof Fence" there is material intermediate between this extreme form and ssp. *eremophila*. The latter is common over a wide range to the north and east of this region. Typical ssp. *pterocarpa* may well be found on other greenstone hills.

MAIAB **Eucalyptus pyrocarpa** *L. Johnson et D. Blaxell*, **nom. et stat. nov.**

Replaced Synonym: *Eucalyptus pilularis* Sm. var. *pyriformis* Maiden in J. Roy. Soc. N.S.W. XLVII (1913) 94.

Lectotype: Bucca Ck, near Coffs Harbour, New South Wales, J.L. Boorman NSW 132570, 6.1911 (NSW).

There are three specimens, all from the type locality, collected by Boorman in June 1911. They are obviously from three different trees, since the shape and size of the fruit etc. differ somewhat and they are in fact labelled "No. 1" to "No. 3". They are therefore Syntypes. Specimen "No. 3" has had a "TYPE" label affixed but no annotation by either Maiden or Blakely. This is also the most complete specimen of the three and is chosen as Lectotype.

Distribution: North Coast Division of New South Wales. This species is known from several localities in the Coffs Harbour district, as well as the Gibraltar Range area. The most southern locality known is southwest of Wauchope in Broken Bago State Forest. Trees of this species grow on generally poorer and drier sites than MAIAA *E. pilularis* but often form a mosaic with this latter species. *E. pyrocarpa* can be readily distinguished in the field from *E. pilularis* by its shaggier bark, (often extending much further up the trunk), denser foliage and glaucous twigs, buds and fruits. Some specimens are intermediate in various characters between the two species but hybrids are uncommon, as the two normally flower at different times (A. Floyd, pers. comm.).

Hybrids of *E. pilularis* with MAIBB *E. planchoniana* occur in a few areas and herbarium specimens bear some resemblance to those of *E. pyrocarpa*. However plants in provenance trials of the latter species at Coffs Harbour show no segregation into "typical" *E. pilularis* or *E. planchoniana* (A. Floyd, pers. comm.), discounting the view that *E. pyrocarpa* may have been of hybrid origin.

One specimen, consisting of fruits only, from Little Bay, Arakoon (east of Kempsey), held at NSW, may be of *E. pyrocarpa*. If this species does occur in this locality, we would expect to find it growing on granitic soil in less sheltered sites than the *E. pilularis* which is common in this area. Specimens collected in September 1972 (Coveny 4274) and October 1972 (Johnson 7532) from c. 4 km NNW. of Brooms Head (NE. of Grafton) have fruit similar to the Arakoon specimen, and differ from the type form of *E. pyrocarpa* (as discussed above) in several features, the most obvious being the shape of the fruit and the lack of pedicels. These three sessile-fruited specimens appear to represent a coastal form of *E. pyrocarpa*, a taxon more variable than previous specimens have indicated. A further coastal population has been reported at Red Rock State Park on sand dunes c. 1·5 km from the sea (E. Daniels pers. comm.). Field observations by one of us (L.J.) on the population near Brooms Head have indicated that the "coastal form" is a component of a dry sclerophyll woodland on a low sandstone ridge, together with *E. planchoniana*, *E. gummifera* and *Angophora costata*. Further field studies will be necessary to determine whether a gradation from "typical" to "coastal" forms exists, particularly in the nature of the fruit, since other characteristics (leaf shape and texture, glaucousness, bark etc.) appear not to vary so markedly.

SPINB **Eucalyptus kartzoffiana** *L. Johnson et D. Blaxell*, **sp. nov.**

Arbor ad 30 m alta; cortex fibrosus ad altitudinem c. 3 m, supra laevis. Folia juvenilia opposita, sessilia, cordiformia, non-connata, glauca, 4–8 cm longa, 2–4 cm lata. Folia adulta lanceolata, non-opposita, 12–22 cm longa, 1–2 cm lata. Umbellastri axillares 3-flori, pedunculo alabastro capsuloque glaucis. Pedunculus complanatus, c. 5 mm longus, 3–4 mm latus. Alabastra matura c. 6 mm longa, c. 3 mm diametro, sessilia, hypanthio cylindrico, operculo (interiore) c. 2 mm longo, conico. Fructus campanulati, glauci, c. 7 mm longi, c. 6 mm diametro; valvae 3, raro 4, exsertae.

HOLOTYPE: c. 4 miles (6·5 km) N. of Araluen (on Braidwood road), New South Wales, L.A.S. Johnson NSW 132571, 1.1968 (NSW). ISOTYPES to be distributed to K, CANB.

DISTRIBUTION: Confined to the valleys of Majors, Bells and Araluen Creeks around Araluen, South Coast District of New South Wales. It grows on relatively dry slopes on soils of granite origin, not occurring on the ridge tops nor extensively on the valley floors. Elevation 400–600 m.

Tree to 30 m high, with smooth ribbony bark above a variable stocking of darkish rough bark on the lower trunk. *Cotyledons* not seen. *Lignotubers* not present. *Juvenile leaves* opposite, sessile, cordate, not connate, glaucous, 4–8 cm long, 2–4 cm broad; intramarginal vein irregular, 2–3 mm from the margin; midrib and lateral veins clearly visible on both surfaces which are similar in appearance; oil glands relatively large and prominent on both surfaces. *Young stems and new shoots* strongly glaucous and prominently warty, particularly when dry. *Adult leaves* lanceolate, not opposite, petiolate, 12–22 cm long, 1–2 cm broad; petiole dorsiventrally flattened, 2–3 cm long, c. 2 mm wide; intramarginal vein c. 1 mm from margin; midrib prominent on both surfaces, but lateral venation indistinct. *Twigs* bearing adult leaves smooth and glaucous. *Inflorescence* *basitonic to mesotonic. **Umbellasters* axillary, 3-flowered, glaucous; peduncle flattened dorsiventrally and distally expanded into a fan-shaped receptacle, c. 5 mm long, 3–4 mm wide. *Mature buds* c. 6 mm long, c. 3 mm in diameter, sessile (or the central bud very slightly pedicellate); hypanthium cylindrical, inner operculum conical, c. 2 mm long; outer operculum shed early. *Fruits* campanulate, glaucous, c. 7 mm long, c. 6 mm in diameter; opercular scars, together with staminophore, forming a flared rim to the fruit; valves 3, rarely 4, exserted up to 2 mm beyond the rim.

This species is named after Mr Michael Kartzoff, of the Forestry Commission of N.S.W., who first collected and recognized it as a distinct taxon in 1949.

E. kartzoffiana is a component of tall forests of SPIFI *E. maidenii*, SPIKK *E. viminalis* and AAABB *Angophora floribunda*. Individuals are relatively uniform and do not show the variations in characters found in plants of hybrid origin, as the species was at first thought to be. It has been placed by Pryor and Johnson in the subseries SPIN *Cordatinae* but its closest affinities are rather obscure.

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* These terms are defined by Carr & Carr (1959) and Johnson (1972).

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The Status of Schlechter's Specimens of Orchidaceae held at the National Herbarium of New South Wales

1. *New Guinea*

D.F. BLAXELL

SUMMARY

Most of the specimens, collected by Schlechter in New Guinea in the early 1900's, held in this Herbarium are Types. The status of these (total 207) is indicated.

INTRODUCTION

Rupp (1950) published a list of the species of New Guinea orchids collected by Rudolph Schlechter between 1901 and 1910 in the German-held territory of Kaiser Wilhelmsland and other German colonies in the Pacific. Rupp also listed species collected in Celebes (Sulawesi), New Caledonia and South Africa. I have included only the New Guinea material.

Unfortunately Rupp only listed the species by name and author without enumerating the specimens individually or by collection number. In many cases more than one collection per species is held. Also he did not indicate the type status of any of the specimens. In fact, Rupp apparently did not consider that these specimens had any status since, in some cases, a "TYPE" label (affixed after receipt of specimens at NSW) was amended to "TYPE form" by him, and yet he often annotated the specimens "loc., date and no. agree"!

Woods (1965) published the results of a survey which had located Schlechter's duplicates of *Liparis* spp. (using this as a representative genus as well as one which he was studying). He listed various herbaria in descending order of the numbers of *Liparis* duplicates held. NSW* ranked fourth on the list after Leiden, Harvard (Oakes Ames Herbarium) and Geneva. In view of the relatively large number of specimens held here the following list should be of value to orchid taxonomists trying to identify and typify New Guinea material.

The following is based upon Rupp's list with some additions and deletions, viz.

(i) a cross (+) is placed in the appropriate square of the Table to indicate either ISOTYPE or ISOSYNTYPE,

(ii) discrepancies between the information on the specimen label and that published in the protologue are noted in the "Remarks" column,

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* Some of the sheets are date-stamped December 1920. Perhaps all the Schlechter specimens were received at that time.

(iii) Schlechter's collection number is indicated,

(iv) the places of publication of the names are indicated by a cross in column "a" or "b". These are:

a. "Die Orchidaceen von Deutsch–Neu–Guinea" and

b. "Nachträge zur Flora der Deutschen Schutzgebiete in der Südsee."

No information is included as to the condition of the specimens, but it should be noted that many of the specimens lack flowers and many others have damaged flowers.

Schlechter is the author of all the names listed.

I have not attempted to list the collection numbers of all the specimens held. In many instances collections, with no type status, of species listed are also held and these have not been included. Also, species listed by Rupp have not been included where they have no type status; this applies to 92 of the total of nearly four hundred.

Attention is drawn to several species which were not included in Rupp's list, e.g. *Dendrobium sikini*, *Galeola gracilis*, *Liparis genychila* etc.

Schlechter's original spelling is used throughout. He obviously used certain epithets deliberately in the substantive, e.g. *Dendrobium potamophila* and *Cadetia stenocentrum*. Rupp's erroneous "corrections" are noted in the "Remarks" column.

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
Acanthephippium papuanum	16864	+	..	+	..	Altitude on label is "c. 850 m." that in protologue is "c. 650 m."
Agrostophyllum dolichophyllum ..	14006	..	+	+	..	
Appendicula dendrobioides	14325	..	+	+	..	as *Podochilus*
Bromheadia pulchra	19288	+	..	..	+	Dates differ; "1909" on label, "1908" in protologue. (However, nos. 19285 and 19294 are dated "1909" in respective protologues); not listed by Rupp
Bulbophyllum						
fruticicola	14415	..	+	+	..	
melinanthum	14577	..	+	+	..	
oxyanthum	14394	..	+	+	..	
Cadetia						
bigibba	19204	+	..	+	..	
chamaephytum ..	14463	..	+	+	..	"*chamaephyton*" (Rupp)
collina	19256	+	..	?	..	dates do not agree
dischorensis	19666	+	..	+	..	
echinocarpa	17909	+	..	+	..	
imitans	19680	+	..	+	..	
obliqua	19970	+	..	+	..	
potamophila	16158	+	..	+	..	
potamophila var. *kenejiae* ..	18357	+	..	+	..	
quinqueloba	18712	+	..	+	..	
stenocentrum	14505	..	+	+	..	"*stenocentra*" (Rupp)

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
takadui	19344	+	..	..	+	
wariana	19342	+	..	?	..	two specimens from the same locality, with the same number are held, but the dates on each differ
Calanthe						
cruciata	17120	+	..	+	..	
inflata	19071	+	..	+	..	
kaniensis	17026	+	..	+	..	
Calymmanthera						
montana	19151	+	..	+	..	
tenuis	16164	+	..	..	+	
	19909	+	..	..	+	
Ceratostylis						
scirpoides	14359	..	+	+	..	
Claderia						
papuana	19266	+	..	..	+	
Coelogyne						
beccarii						
var. *tropidophora*	19110	+	..	..	+	
fragrans	18083	+	..	..	+	
	18216	+	..	..	+	
Corybas						
gastrosiphon	16948	+	..	..	+	described as *Corysanthes*
Cryptostylis						
fulva	19546	+	..	+	..	
Cystorchis						
dentifera	17358	+	..	+	..	

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
Dendrobium						
abbreviatum	16598	+	..	..	+	
aberrans	19550	+	..	+	..	spelt "*aberans*" in protologue
acutilobum	16874	+	..	+	..	
apertum	18593	+	..	+	..	
appendicula	18137	+	..	+	..	
auricolor						
var. *major*	17042	+	..	..	+	
axillare	17052	+	..	+	..	
brevilabium	19587	+	..	+	..	
cadetioides	19505	+	..	+	..	
chloroleucum	19096	+	..	..	+	
clausum	18168	+	..	+	..	
decumbens	17296	+	..	..	+	
disoides	17118	+	..	+	..	two sheets
djamuense	16822	+	..	+	..	in Rupp's list as "*difamuense*"
dryadum	18211	+	..	+	..	dates differ
fariniferum	17817	+	..	..	+	two sheets
fornicatum	19539	+	..	+	..	
frigidum	18723	+	..	?	..	There is confused labelling. The specimen is labelled "*D. fulgens*" (or similar spelling) and the number is 18753!
gatiense	16991	+	..	+	..	
globiflorum	17141	+	..	+	..	two sheets
grossum	19073	+	..	..	+	
hamadryas	17336	+	..	..	+	
hippocrepiferum	18736	+	..	+	..	
hymenocentrum	20000	+	..	+	..	
lamproglossum	18544	+	..	+	..	altitudes differ; "1100 m" on sheet, "1400 m" in protologue

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
leucohybos var. *leucanthum*	17486	+	..	..	+	
litorale	19958	+	..	..	+	
loeseneranum	20280	+	..	+	..	
lucidum	19712	+	..	+	..	
meliodorum	17888	+	..	+	..	dates differ; "July 1908" on sheet, "June 1908" in protologue
minjemense	16245	+	..	+	..	dates differ; "July 1909" on sheet, "July 1907" in protologue
mischobulbum	18030	+	..	..	+	
musciferum	18958	+	..	..	+	
nardoides	18722	+	..	+	..	
obliquum	18882	+	..	+	..	
obovatum	16656	+	..	+	..	
odontopus	17248	+	..	?	..	the sheet lacks a number; other details match
oreodoxa	18804	+	..	+	..	"*oreodoxum*" (Rupp)
oreogenum	14308	..	+	+	..	
paludicola	13915	..	+	+	..	"*paludicolum*" (Rupp)
perlongum	17102	+	..	+	..	
petiolatum	18710	+	..	+	..	
piestocaulon	14632	..	+	+	..	
var. *kaubense*	16831	+	..	+	..	
pluricostatum	19269	+	..	+	..	
pleurodes	19580	+	..	+	..	
polyschistum	20279	+	..	+	..	
poneroides var. *angustum*	16688	+	..	+	..	
potamophila	16482	+	..	+	..	"*potamophilum*" (Rupp)

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
prostheciglossum	18174	+	..	+	..	
var. *obtusilobum*	18805	+	..	+	..	
pumilio	16545	+	..	..	+	
	17998	+	..	..	+	
quadriferum	17143	+	..	?	..	dates differ; "1906" on specimen, "1908" in protologue
regale	19068	+	..	..	+	
rhytidothece	19518	+	..	+	..	No. on specimen is "195118" "*rhytidothecum*" (Rupp)
roseoflavidum	19475	+	..	+	..	
rubropictum	19981	+	..	?	..	dates differ; "1909" on specimen, "1908" in protologue
sarcodes						
var. *majus*	18655	+	..	+	..	
sarcophyllum	18013	+	..	+	..	
scarlatinum	17966	+	..	+	..	
scopula	19146	+	..	+	..	"*scopulum*" (Rupp)
setosum	17249	+	..	+	..	
sikini	16283	+	..	+	..	not listed by Rupp
subpetiolatum	20208	+	..	+	..	
subsessile	16735	+	..	+	..	
theionanthum	19630	+	..	+	..	
trachyrhizum	20237	+	..	..	+	
	17836	+	..	..	+	
triste	20246	+	..	+	..	
undatialatum	17960	+	..	+	..	
violaceo-pictum	17079	+	..	?	..	specimen is lacking a no.
warianum	19951	+	..	+	..	
xanthocaulon	18915	+	..	..	+	

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
Eria						
bracteata	19285	+	..	+	..	
collina	19294	+	..	+	..	
cordifera	17687	+	..	+	..	
diphylla	16582	+	..	+	..	two sheets
iodantha	17682	+	..	+	..	„ „
ramuana						
var. *wariana*	19817	+	..	..	+	
rhodoleuca	16210	+	..	+	..	
truncicola	17633	+	..	+	..	
Eulophia						
imperatifolia	14301	..	+	..	+	
Eurycentrum						
monticola	18555	+	..	+	..	"*monticolum*" (Rupp)
Galeola						
gracilis	19966	+	..	?	..	specimen is labelled "*G. montigena* n. sp." but the data on label matches that in protologue of *G. gracilis* which was not listed by Rupp
Glossorhyncha						
hamadryas	14015 14647	.. ..	+ +	.. ..	+ +	
squamulosa	14556	..	+	+	..	
Goodyera						
erythrodoides	17748	+	..	..	+	
Habenaria						
nana	18009	+	..	+	..	
pachyneura	18824	+	..	+	..	
Hylophila						
orientalis	17393 19453	+ +	.. ..	.. ..	+ +	

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
Lecanorchis						
papuana	16952	+	..	..	+	
Lectandra						
podochiloides	14367	..	+	+	..	as "*Eria podochiloides*"
Lepidogyne						
sceptrum	19166	+	..	..	+	
Liparis						
acaulis	14474	..	+	?	..	no. on specimen is "14475"; other data match
altigena	18706	+	..	+	..	
anemophila	17100	+	..	..	+	
apiculata	16552	+	..	+	..	
calcaria	18027	+	..	+	..	
caricifolia	18590	+	..	+	..	
chlorantha	17147	+	..	+	..	
cyclostele	19301	+	..	..	+	
dolichobulbon	17224	+	..	..	+	
	19054	+	..	..	+	
genychila	14001	..	+	+	..	not listed by Rupp
graciliscapa	16807	+	..	+	..	
lamproglossa	18625	+	..	+	..	
leptopus	19629	+	..	+	..	
mapaniifolia	19322	+	..	+	..	altitudes differ; "350 m" on specimen, "450 m" in protologue
melanoglossa	17425	+	..	..	+	
	19526	+	..	..	+	
microblepharon	19413	+	..	+	..	
nebuligena	16961	+	..	..	+	
ochrantha	16308	+	..	..	+	
	18260	+	..	..	+	
ovalis	18056	+	..	+	..	

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
persimilis	18999	+	..	+	..	
spectabilis	17060	+	..	..	+	
stenostachya	17423	+	..	..	+	
sympodialis	19425	+	..	..	+	
trachyglossa	20338	+	..	+	..	
truncicola	16674	+	..	+	..	
truncicola						
var. *oblanceolata*	18627	+	..	..	+	
	19066	+	..	..	+	
Macodes						
dendrophila	18210	+	..	..	+	
	19165	+	..	..	+	
Malleola						
wariana	19558	+	..	+	..	
Microstylis						
arachnoidea	13846	..	+	?	..	no. & date agree, but localities differ "*arachnoides*" (Rupp)
Nervilia						
porphyrophylla	18299	+	..	..	+	
Paphiopedilum						
violascens	18182	+	..	..	?	dates differ
Phaius						
montanus	19135	+	..	..	+	
Phalaenopsis						
amabilis						
var. *papuana*	18409	+	..	..	+	
	19308	+	..	..	+	
Pholidota						
imbricata						
var. *longifolia*	17535	+	..	+	..	no. on specimen is "177535"

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
Phreatia						
brachystachys	14672	..	+	+	..	
petiolata	13847	..	+	+	..	locality details differ
Platylepis						
lamellata	18028	+	..	+	..	
Plocoglottis						
maculata	19316	+	..	?	..	slight difference in habitat details
papuana	16425	+	..	..	+	
	17006	+	..	..	+	
pseudomoluccana ..	18522	+	..	..	+	
sakiensis	18285	+	..	?	..	altitudes differ; "c. 200 m." on specimen, "c. 300 m" in protologue
Podochilus						
imitans	14370	..	+	+	..	
polytrichoides	13935	..	+	+	..	
Pomatocalpa						
pomatophilum ..	16312	+	..	..	?	locality information differs
	18287	+	..	..	?	
Pseuderia						
floribunda	17830	+	..	+	..	
frutex	14424	..	+	+	..	as *Dendrobium*; not listed by Rupp
pauciflora	16810	+	..	+	..	habitat details differ slightly
wariana	19272	+	..	+	..	habitat details differ slightly
Sarcochilus						
chrysanthus	17029	+	..	+	..	
odoratus	16569	+	..	+	..	
Schoenorchis						
densiflora	17316	+	..	+	..	
Spathoglottis						
grandifolia	18050	+	..	..	+	

Name	Schlechter Collection Number	Place of Publication		Type Status		Remarks
		a	b	ISOTYPE	ISOSYNTYPE	
Taeniophyllum						
clavatum	18562	+	..	+	..	
kaniense	16963	+	..	+	..	
macranthum	19307	+	..	..	+	
pubicarpum	16542	+	..	+	..	
quaquaversum	20109	+	..	+	..	
Thrixspermum						
collinum	16148	+	..	+	..	
Trichoglottis						
papuana	17297	+	..	..	+	
sororia	16576	+	..	+	..	
Tropidia						
acuminata	19333	+	..	+	..	
gracilis	13869	..	+	+	..	
Vandopsis						
longicaulis	18420	+	..	+	..	
Vrydagzenia						
rivularis	19083	+	..	..	+	dates differ; "1907" on specimen, "1909" in protologue
	19043	+	..	..	+	
Zeuxine						
atrorubens	18053	+	..	+	..	
dipera var. *laxa*	17811	+	..	+	..	dates differ; "1909" on specimen, "1908" in protologue
torricellensis	14695	..	+	..	+	

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An Annotated Botanical Bibliography of Lord Howe Island

JOHN PICKARD

SUMMARY

One hundred and fifteen papers, books, articles and pamphlets dealing either directly or indirectly with the botany of Lord Howe Island are listed. The papers are classified into 14 categories to facilitate entry into the bibliography.

INTRODUCTION

In 1970–71 a Biological Survey of Lord Howe Island was conducted by botanists from the National Herbarium of New South Wales and the Australian Museum as well as zoologists from the Australian Museum and other institutions. The author collaborated in the vegetation survey of the island which is located some 550 km off the east coast of Australia (31° 32′ S 159° 05′ E). During preliminary reading it became very clear that a carefully compiled botanical bibliography was long overdue. All botanical references to Lord Howe known to the author were checked and any references in these were confirmed. This paper presents the results of such a compilation.

Some 115 titles are listed below. It is interesting to note that many of the early works apparently had not been seen by most later authors who cite them and their references to these papers are often quite incorrect.

This bibliography is restricted to papers, books and manuscripts referring to the flora or vegetation of Lord Howe Island. However, this has been interpreted reasonably broadly to include a number of early works which are not well known or at least have not been correctly cited in the past.

USE OF THE BIBLIOGRAPHY

The papers are arranged alphabetically by authors and chronologically within authors. The full titles are given except, as in the case of some reports (e.g. Duff 1882a, b) where there is no specific title. In these cases an indication of content is given in parentheses. Abbreviations of journals (with one or two exceptions) follow those in Lawrence *et al.* (1968)[†]. Some papers with virtually no botanical information are listed because they have been cited in the past and they are included here to save future workers the trouble of referring to them for botanical data. The brief abstract gives some indication of scope and depth of content. Any new combinations or descriptions of new taxa of Lord Howe Island plants in the papers are listed.

These names may or may not be those currently recognized by taxonomists. However, no attempt has been made to list the original places of publication of all plant taxa of the island.

[†] Lawrence, G.H.M., Buchheim, A.F.G., Daniels, G.S., and Dolezal, H. eds. (1968).—B-P-H Botanico-Periodicum-Huntianum. (Hunt Botanical Library: Pittsburgh.)

Each paper is numbered and classified according to content to facilitate entry to the bibliography via Table 1. Thus, for details of Phytogeography of Lord Howe, papers 12, 13, 26 . . . would be relevant. Papers which are listed more than once in the bibliography (usually under alternative authors e.g. Anon.; Phillip, Shortland) for cross-referencing are numbered only at the primary reference and secondary entries are marked with an asterisk (*).

TABLE 1

Classified Index to the Bibliography

Flora: Total: 20, 24, 40, 41, 49, 54, 64, 69, 77, 78, 83, 90, 101, 114.
  Algae: 60.
  Lichens: 27, 28, 29, 30, 58, 59, 86, 87, 115.
  Mosses: 5, 25, 46, 51, 52.
  Liverworts: 106.
  Ferns: 9, 10, 11, 14, 18, 22, 23, 31, 36, 64, 110, 111, 112.
  Monocotyledons: 8, 15, 16, 19, 38, 44, 45, 65, 82.
  Dicotyledons: 50, 55, 56, 64, 66, 67, 99, 102, 103, 104, 105, 108, 109.
Floristic List: 3, 4, 24, 49, 54, 64, 68, 77, 78, 80, 81, 84, 90, 100, 107.
Phytogeography: 12, 13, 26, 48, 54, 80, 91, 92, 93, 107.
Vegetation: 2, 3, 4, 33, 53, 54, 61, 62, 63, 64, 68, 73, 75, 76, 77, 78, 89, 90, 95, 96, 114.
History: 1, 2, 21, 47, 57, 88, 94, 97, 98, 113.
General Descriptive: 32, 35, 37, 39, 42, 43, 47, 57, 70, 71, 72, 88, 91, 113.
Miscellaneous: 6, 7, 8, 17, 34, 42, 57, 70, 73, 74, 85, 94.

1. Anon. (comp.) (1789).—The Voyage of Governor Phillip to Botany Bay; with an account of the establishment of the colonies of Port Jackson and Norfolk Island; compiled from authentic papers, which have been obtained from the several departments. To which have been added the journals of Lieuts. Shortland, Watts, Ball and Capt. Marshall. (Printed for John Stockdale, Picadilly: London.)

Traditionally this volume has been indexed as Phillip, A. (1789).—The Voyage to—etc. However, the author believes this is incorrect, as Phillip is neither the author nor the compiler of the volume. The preface gives no clues as to the compiler, although the "Advertisement" pp. i–iii indicates that the necessary sources were supplied to the publisher. Using this as a basis, the author has decided to index this work under Anon.

The relevant papers from this book have usually been indexed under Shortland and Watts, and Ball.

The following information was extracted from the journal of Ball by the compiler of the book:—

p. 94: Discovery of Lord Howe Island by Ball, 17th Feb. 1788.

pp. 180–182: Remarks by Ball on the topography and some general observations on the vegetation: "cabbage-palms mangroves and manchineal trees, even up to the summits of the mountains". The cabbage palms are *Howea* spp., the mangroves are discussed below, and the manchineal is probably *Ochrosia elliptica*.

pp. 223–226: Notes on topography and vegetation by Lieut. Watts (17th May 1788): "This island is well covered with wood, the chief of which is the large and dwarf mangroves, the bamboo and the cabbage tree. The different vegetables met with were scurvy grass, wild celery, spinach, endive, and samphire". The "mangrove" is very unlikely to be either *Avicennia* or *Aegiceras* which are very restricted on the island. Although there is no evidence for greater (or lesser) numbers of mangroves in the past, it seems reasonable to assume that both Ball and Watts are referring to the more common terrestrial trees such as *Cryptocarya* and *Drypetes*.

The "bamboo" may be either *Flagellaria indica; Cyperus haematodes* or *Phragmites australis*. The "cabbage tree" is one or both of the *Howea* palms but the identity of the vegetables is difficult to guess. The "celery" is probably an *Apium* species and the "samphire" may be *Salicornia quinqueflora*.

2. Anon. (1853).—Proposed penal settlement. Votes and Proceedings of Legislative Council of New South Wales *1*: 273 and *2*: 707–724.

This is the recommendation from the Governor-General that Lord Howe Island be used as a penal settlement for the reception of "the more hardened of Colonial Convicts".

The report is bound as pp. 707–724 in volume 2 (with two maps). The contents are listed here in detail as Maiden (1898, p. 117 *et seq.*) cited them in a confusing manner. For details of the various reports see under each author.

Schedule of Contents

1. Minute (52–6) of Executive Council on 10th Feb. 1852 respecting establishment of a penal settlement.

2. Letter: Lt. Governor La Trobe to Colonial Secretary 22nd July 1851, on above subject.

3. Letter: Surveyor-General to Colonial Secretary 8th January 1835, concerning report on Lord Howe's Island.

Enclosure in no. 3: Report on Lord Howe's Island by H.J. White, 7th Jan. 1835.

4. Letter: Convict Classification Board to Colonial Secretary, 2nd Feb. 1835 enclosing return of doubly-convicted prisoners.

Enclosure in no. 4: Return as detailed above.

5. Statement of circumstances in reference to Lord Howe's Island, situated off the coast of New South Wales, between the Heads of Port Jackson and Norfolk Island, furnished by Dr. Foulis, of Sydney (plus map). Dated September 1st 1851.

6. Statement of Convict Establishment of Norfolk Island, 30th September 1844.

7. Letter: Colonial Secretary, N.S.W., to Colonial Secretary, Van Dieman's Land, 20th March, 1852, respecting Colonial Convicts being sent to Norfolk Island.

8. Letter: Comptroller General of Convicts, Van Dieman's Land to Colonial Secretary, N.S.W., in reply 25th May 1852.

9. Minute (52–23) of Executive Council of 5th July 1852 on subject of Penal Settlement.

10. Letter: Duke of Newcastle to Governor-General 19th January 1853.

11. Letter: Colonial Secretary to Captain Denham 30th July 1853, applying for information respecting Lord Howe's Island.

12. Letter: Captain Denham to Colonial Secretary 20th August 1853 in reply.

Enclosure 1: Remarks upon Lord Howe Island by Captain Denham, R.N., F.R.S. Communicated at the request of His Excellency, Sir Charles Augustus Fitz Roy, Governor-General of the Australian Colonies (plus map).

Enclosure 2: Remarks on the Natural History and Capabilities of Lord Howe Island by John Denis Macdonald.

13. Minute (53–52) of Executive Council, 24th October 1853, suggesting that the matter be referred to a Select Committee of the Legislative Council.

3. Anon. (1870a).—Official visit by the Water Police Magistrate and the Director of the Botanic Gardens Sydney; together with a description of the Island, by Edward S. Hill. Votes and Proceedings of the Legislative Assembly of New South Wales 1870 *1*: 635–654.

This paper is indexed under Anon., as Hill is neither the author nor the compiler, although he wrote the preface and one of the papers.

The contents are:

Hill, E.S.: Preface p. 635.

White, H.F.: Map p. 636.

A reduction of White's map of Lord Howe Island (1835) which gives the location incorrectly as 31° 30′ S 15° 9′ E (off the southwestern coast of Africa).

Anon.: Lord Howe Island 1788. Epitome of events prior to, and the cause which led to the discovery of Lord Howe Island. pp. 637–638.

Cloete, P.L.: Official report by the Water Police Magistrate. pp. 638–639.

Cloete, P.L.: No title,—letter to the Principal Under Secretary. p. 639.

Moore, G.: Sketch of the vegetation of Lord Howe Island. pp. 640–643.

Hill, E.S.: Lord Howe Island, 1869. 643–653.

4. Anon. (1870b).—Lord Howe Island. Official visit by the Water Police Magistrate and the Director of the Botanic Gardens, Sydney; together with a description of the island by Edward S. Hill. (N.S.W. Government Printer: Sydney) 8vo, 60 pp.

This pamphlet is apparently a reprint, in a different format, of Anon. (1870a).

The pamphlet has been cited as "Hill, E.S. (1870.—Lord Howe Island. Official visit . . ." but a study of the contents reveals that a "description of the island by Edward S. Hill" in the title refers only to a paper in the pamphlet (see under Hill, 1870b) and not to the pamphlet itself.

The contents are as follows:—

White, H.J.: Reduction of White's 1835 map of Lord Howe Island (Frontispiece).

Anon.: Lord Howe Island. 1788. Epitome of events prior to, and the cause which led to the discovery of Lord Howe Island. pp. 7–9.

A brief résumé of the discovery of the island and extracts from relevant journals.

Cloete, P.L.: Official report by the Water Police Magistrate. Homicide at Lord Howe Island. pp. 11–14.

A summary of a murder and subsequent inquiry.

Cloete, P.L.: No title—a letter to the Principal Under Secretary, Sydney. pp. 14–16.

Brief details of the island inhabitants.

Moore, C.: Sketch of the vegetation of Lord Howe Island. pp. 17–27.

See below under Moore (1870b).

Hill, E.S.: Lord Howe Island, 1869. pp. 31–60.

See below under Hill (1870b) for details.

5. Anon. (1892).—Notes and exhibits. Proc. Linn. Soc. New South Wales *7*: 277.

A list of 20 moss species from Lord Howe exhibited by T. Whitelegge. The mosses were determined by Brotherus.

6. Anon. (1911).—Report of the Royal Commission of Inquiry into the control of the Kentia palm seed question of Lord Howe Island. Legislative Assembly of New South Wales. Joint Volumes of Papers *7*: 945–1004.

The only botanical information is Appendix R which lists the quantity of palm seed exported in various years.

Annual Output of Seeds in Bushels

Year	*Howea belmoreana* 4,000 seeds/bushel	*Howea forsterana* 5,000 seeds/bushel	*Hedyscepe canterburyana* 1,400 seeds/bushel	Total
1906–7	1,768·5	1,913	29	3,710·5
1907 (½ year) ..	201·5	750·5	12	964
				4,674·5
1908	847·5	1,008·5	19	1,875
1909	826·25	1,034·25	16	1,876·5
1910	686	1,336	15	2,039

Average 1906–1907: 2,337 bushels/annum
1 bushel = 0·034 m^3

7. Anon. (1912).—Report of the Royal Commission of Inquiry into the condition and welfare of the residents of Lord Howe Island and into the control of the Kentia palm seed trade. Legislative Assembly of New South Wales Joint Volumes of Papers *4*: 1143–1161.

This report contains no botanical information. Appendix B lists, *inter alia*, the seed sold by one company and this is reproduced below. There are discrepancies between this list and that in Anon. (1911) above.

Year	*No. of bushels of seed sold*
1906 (½ year)	1,143
1907	3,338
1908	1,654
1909	1,930
1910	2,302
1911	2,562
1912 (10 months)	1,555·5

The discrepancies noted above are impossible to explain but presumably the figures are from different sources. The figures above probably refer to total seed sold of all species.

* Anon. (1928).—Lord Howe Island—a naturalist's paradise. Wentworth Magazine *4* (2 August): 4–6 and 46–47 *and 4* (3 October): 4–6 and 18.

See McCulloch (1928).

8. Bailey, L.H. (1939).—Howea in cultivation.—The sentry palms. Gentes Herb. *4*: 188–198.

Notes and illustrations of both species (*Howea forsterana* and *H. belmoreana*).

9. Baker, J.G. (1872).—Ferns of Lord Howe Island. Gard. Chron. *31*: 252–253.

Describes two new species of ferns: *Hemitelia moorei* Baker, and *Deparia nephrodioides* Baker.

10. Baker, J.G. (1873).—New ferns from Lord Howe's Island. J. Bot. *11*: 16–17.

Describes two new species: *Todea moorei* Baker, and *Asplenium pteridoides* Baker.

11. Baker, J.G. (1874).—Tree-fern from Lord Howe's Island. J. Bot. *12*: 279–280.

Baker notes that *Hemitelia macarthurii* F. Muell. and *Cyathea moorei* are identical and makes the new combination *Cyathea macarthurii* (F. Muell.) Baker. It is interesting to note that *C. moorei* is not currently regarded as identical with *C. macarthurii.* (In the original description Mueller used the epithet "macarthuri" which is now regarded as orthographically incorrect.)

12. Balgooy, M.M.J. van (1960).—Preliminary plant-geographical analysis of the Pacific as based on the distribution of phanerogam genera. Blumea *10*: 385–430.

Lord Howe belongs "to the Australian Region, within which . . . (it shows) the greatest affinity to the New Zealand District . . . Lord Howe . . . forms a subdistrict of its own". This is based on tables using fifteen categories of generic affinity.

13. Balgooy, M.M.J. van (1971).—Plant geography of the Pacific. Blumea Suppl. *6*: 1–222.

This is a more detailed version of Balgooy (1960) and contains more discussion on the methods employed. Various phytogeographic systems used in the past are assessed. Balgooy again concludes that "the best solution is to maintain Lord Howe I. as a district within the New Zealand Subregion . . .".

* Ball, H.L. (1789).—[Discovery of Lord Howe Island] p. 94 *in* Anon. (1789).—The Voyage of Governor Phillip to Botany Bay . . . (John Stockdale: London).

See under Anon. (1789).

14. Ballard, F. (1955).—Fern and fern allies: miscellaneous notes. Kew Bull. *9*: 559–561.

Includes two new combinations from Lord Howe Island: *Ctenitis nephrodioides* (Bak.) Ballard, and *C. apicalis* (Bak.) Ballard.

15. Beccari, O. (1877).—Le specie di palme raccolte alla Nuova Guinea da O. Beccari e dal medesimo acesso descritte, con note sulle specie dei paesi circonvicini. Malesia *1*: 7–96.

From Lord Howe: *Kentia canterburyana, Clinostigma mooreanum* and *Howeia* (*sic*) nom. nov.

16. Beccari, O. (1913).—Contributi alla conconscenza delle palme. Webbia *4*: 143–240.

A taxonomic treatment with details of *Howea forsterana* and *H. belmoreana* pp. 156–168 (in Italian).

17. Bell, R. (*c.* 1911).—Photographs of Norfolk and Lord Howe Islands. (Unpublished prints in photograph collection, Mitchell Library—Library of New South Wales, Sydney.)

The photographs are of individual plants or groups of plants without exact locations. Bell resided on Lord Howe Island for three years *c.* 1911 and his photographs are remarkable for detail and quality. Unfortunately most appear to have been lost.

18. Bennett, G.D. (1872a).—No title—extracts from a letter to the editor. Gard. Chron. *31*: 113.

Informal descriptions of two undescribed species of *Alsophila* found by Carron on the island *c.* 1871.

19. Bennett, G.D. (1872b).—Iris Robinsoniana. Gard. Chron. *31*: 393.

A description of this Lord Howe Island endemic plant in cultivation in the Royal Botanic Gardens, Sydney.

20. Bentham, G. (1863–78).—Flora Australiensis. (Lovell Reeve: London.)

The following information was extracted from Oliver (1916) p. 159.

A total of 112 names are given by Bentham for Lord Howe Island plants. These are distributed in the work as follows:—

Vols 1–5 (1863–70): 20 species
Vol. 6 (1873): 16 species
Vol. 7 (1878): 76 species

21. Blackburn, D. (1934).—Letters of David Blackburn 1788. Roy. Austral. Hist. Soc. J. & Proc. *20*: 318–334.

Letters from Blackburn, Master of the "Supply" (in which Ball discovered Lord Howe Island) to Richard Knight in England.

p. 326: discovery of Lord Howe Island.

p. 327: return to Lord Howe.

The description is essentially similar to descriptions given by Ball and others about the same period: "At its south End stands two very High Mountains coverd. at the top with Cabbage trees & shrubs. Indeed the Whole of the Island abounds in the Cabbage and Mangrove".

22. Bonaparte, Le Prince R. (1915).—Océanie I. Plusiers régions. Plusiers collecteurs. Herbier du Prince Bonaparte. Notes Ptérid. *1*: 183–204.

Includes one new taxon from Lord Howe: *Adiantum aethiopicum* var. *nodosum.*

23. Bonaparte, Le Prince R. (1917).—Océanie I. Plusiers régions. Plusiers collecteurs. Herbier du Prince Bonaparte. Notes Ptérid. *5*: 119–131.

Includes one new taxon from Lord Howe: *Pteris comans* var. *furcata.*

24. Boorman, J.L. (1921).—Lord Howe Island plants. Unpublished 89 pp. MS in Royal Botanic Gardens, Sydney, Library.

This was written by Boorman after a collecting trip to Lord Howe Island. Not all species known at the time are included. Notes on each species are given but there is a large amount of misinformation and the quality is so inconsistent as to be very suspect. The MS has annotations dated 1945 by J.D. McComish, an amateur island botanist, and these correct a number of the more outstanding errors.

25. Brotherus, V.F. and Watts, W.W. (1915).—The mosses of Lord Howe Island. Proc. Linn. Soc. New South Wales *40*: 363–385.

Lists of the species collected by Watts in July 1911 with some synonymy, localities and notes. One new variety and twenty new species are described jointly by these authors, together with two species described by Brotherus alone: *Fissidens wattsii* and *Trachyloma wattsii: Holomitrium perichaetiale* (Hook.) Brid. var. *robustum*, *Fissidens amblyothallioides*, *F. subtenellus*, *F. tenelliformis*, *F. longiligulatus*, *F. arcuatulus*, *Tortella subflavovirens*, *Macromitrium subbrevicaule*, *Bryum diversinerve*, *B. aequicollum*, *B. philonotideum*, *B. limbifolium*, *B. howeanum*, *B. leptothecioides*, *Echinodium parvulum*, *Thuidium trachypodioides*, *Ectrotothecium howeanum*, *Isopterygium howeanum*, *Rhaphidostegium subfalcatulum*, *Oxyrrhynchium howeanum*, *Rhynchostegiellea campylioides.* The supplementary notes on p. 383 *et seq.* give some details of earlier published work on the mosses of the island.

26. Brownlie, G. (1965).—The geographical affinities of the South Pacific island fern floras. Pacific Sci. *19*: 219–223.

Author's abstract: "The theory is proposed that the fern floras of the South Pacific, while being predominantly recently Malaysian in origin, consist also of two older elements, one being relic only of an ancient world-wide flora, the other an earlier Malaysian invasion confined now to the older and larger islands only. A fourth minor element is a recently evolved southern or subantarctic group". The relationships of the Lord Howe Island fern flora are discussed on p. 222 where the author concludes that "the relationship is predominantly with the Australian mainland. There is, however, a suggestion of a somewhat older group shown by the endemic elaboration in the Hymenophyllaceae . . . It seems that the fern flora of Lord Howe is not merely one with an immediate relationship to the nearest source of supply . . ."

27. Cheel, E. (1903).—Bibliography of Australian lichens. J. & Proc. Roy. Soc. New South Wales *37*: 171–182.

Although there is no direct reference to Lord Howe in this paper, Cheel (1906) refers to two papers listed here. These have been examined and are listed in this bibliography.

28. Cheel, E. (1906).—Bibliography of Australian, New Zealand, and South Sea island lichens. (Second paper) J. & Proc. Roy. Soc. New South Wales *40*: 141–154.

Four references to Lord Howe are listed on p. 153. As two are cross-referenced to Cheel (1903), both papers are necessary. All four papers have been examined and are included in this bibliography.

29. Cheel, E. (1911).—Australasian and South Sea Islands Stictaceae. Part I. Report of the 13th Meeting Australasian Association for the Advancement of Science Sydney 1911 *13*: 254–270.

There is scant reference to Lord Howe in this paper.

30. Cheel, E. (1913).—Australasian and South Sea Island Stictaceae. Part II. Report of the 14th Meeting of the Australasian Association for the Advancement of Science Melbourne 1913 *14*: 311–320.

Lists *Sticta poculifera* Mull.-Arg. and *S. mooreana* A. Zahlbr. from Lord Howe.

31. Christ, H. (1905).—Über die australien *Polystichum*—Arten. Ark. Bot. *4* (12): 1–5.

One new taxon is described from Lord Howe: *Polystichum moorei*.

32. Clark, H.L. (1935).—The paradise of the Tasman. Natl. Geogr. Mag. *68*: 115–136.

A general descriptive article on the island, its system of government, the tourist industry etc. There is virtually no botanical information.

33. Clark, S.S. and Pickard, J. (in preparation)—Vegetation of Lord Howe Island.

A series of papers with detailed discussion of the vegetation using subjective observations and computer methods.

34. Clarke, W.B. (1870).—Fossils in Lord Howe's Island. Anniversary Address. J. & Proc. Roy. Soc. New South Wales *4*: 37.

Although this is chiefly an account of the fossils and geology of the island, reference is made to the flora and particularly to the banyan (*Ficus columnaris*).

35. Clarson, W. (1882).—The Island of Lord Howe. The Madeira of the Pacific (12 mo. Gibbs, Shallard & Co: Sydney) 24 pp. Reprinted from the Illustrated Sydney News July and August 1882.

A descriptive article on the flora of the island with notes on the habit of 12 trees and 11 ferns. The crops of the island are described in detail. This work is generally cited under the nom-de-plume of "Linnaeus" (1882).—The Island . . .

36. Copeland, E.B. (1942).—Filicum novarum cxxviii diagnoses. Univ. Calif. Publ. Bot. *18*: 217–226.

One new taxon and one new name from Lord Howe Island. *Grammitis nudicarpa* Copel. sp. nov., *G. wattsii* Copel. nom. nov.

37. Corrie, A.T. (1878).—A visit to Lord Howe Island. Proc. Roy. Geogr. Soc. *22*: 136–143.

A short descriptive account with little detail on the vegetation but with informative notes on the islanders, their dwellings and activities.

38. Daveau, J. (1896).—Dichogamie protérandre chez le *Kentia* (*Howea*) *Belmoreana*. J. Bot. (Morot) *10*: 25–26.

A short paper on the inflorescence of *Howea belmoreana* with details of structure etc.

39. Denham, H.M. (1853).—Remarks upon Lord Howe Island. 20th August 1853. Votes and Proceedings of the Legislative Council of New South Wales 1853 *2*: 726–727.

This has virtually no botanical information.

40. Duff, J. (1882a).—No title [Report on the vegetation of Lord Howe Island] pp. 1471–1474 *in* Wilson, J.B. (1882a).—Lord Howe Island (Report on present state and future prospects) Votes and Proceedings of the Legislative Assembly of New South Wales 1882 *4*: 1463–1474.

For details see Duff (1882b).

41. Duff, J. (1882b).—No title [Report on the vegetation of Lord Howe Island] pp. 28–36 *in* Wilson, J.B. (1882b).—Report on the present state and future prospects of Lord Howe Island (N.S.W. Government Printer: Sydney).

These two papers are identical in content, the only difference being the format of publication. For details of this see the notes under Wilson (1882a, b). The paper describes differences between the palms and has notes on their distribution. Notes on crops and vegetables include a list of species grown at the time. Duff mentions (p. 36) a collection of "specimens of plants found on Ball's Pyramid and the Admiralty Islands . . ." These appear to have been lost: they are not in the National Herbarium of New South Wales, Duff's institution, and are not mentioned by later authors particularly Maiden who was Director of the institution.

42. Etheridge, R. Jnr (1889a).—Lord Howe Island; its zoology, geology and physical characters. Austral. Mus. Mem. *2*: 1–132.

This memoir is the result of the first scientific survey of Lord Howe. There is little original botanical information but the papers contain useful background data. The papers are:—

Etheridge, R. Jnr: General zoology, 1–42.
North, A.J.: Oology, 43–48.
Ogilby, J.D.: Reptiles and fishes, 49–74.
Olliff, A.S.: Insects, 75–98.
Etheridge, R. Jnr: Geology and physical character, 99–126.
David, T.W.E.: Notes on rock specimens, 127–132.

Included are three folded maps:

(a) a copy of Ball's original 1788 sketch map;
(b) a copy of H.J. White's 1835 survey (see under Anon. 1870a);
(c) a geological sketch map by Wilkinson (see under Wilson 1882b).

(For full details of maps, refer to Pickard (1972a).)

43. Etheridge, R. Jnr (1889b).—Note on the bibliography of Lord Howe Island. Proc. Linn. Soc. New South Wales (2nd Ser.) *4*: 627–631.

This paper supplements the bibliographical notes scattered throughout Etheridge (1889a). It deals mainly with the reports listed here as Anon. (1853) and summarizes these reports. There is little botanical data included.

44. FitzGerald,† R.D. (1882a).—Cleisostoma erecta. Australian Orchids *1* (4) No. 5.

An illustration and short description of the orchid currently (1972) known as *Plectorrhiza erecta.*

45. FitzGerald, R.D. (1882b).—Dendrobium moorei (Mueller). Australian Orchids *1* (7) No. 10.

An illustration of this orchid which is endemic to Lord Howe Island.

46. Forster, J.B. (1901).—*Rhacomitrium leptostomoides* J.B. Forst. nov. spec. Ann. Naturh. Hofm. Wien *16*: 71.

Description of a moss from Lord Howe Island.

47. Foulis, J. (1853).—Statement of circumstances in reference to Lord Howe's Island, situated off the coast of New South Wales, between the heads of Port Jackson and Norfolk Island. Votes and Proceedings of the Legislative Council of New South Wales *2*: 719–721.

This report is dated 1st September 1851 but was not published until 1853 in the Votes and Proceedings. It is one of the sub-reports in Anon. (1853) and it refers *inter alia* to the forest cover but there is little direct botanical information. An extremely inaccurate sketch map (p. 733) shows topographic features, cleared land, settlements etc. For further details see Etheridge (1889b) or Maiden (1898).

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† See note re spelling of FitzGerald under reference 57.

48. Good, R. (1957).—Some problems of southern floras with special reference to Australasia. Austral. J. Sci. *20*: 41–44.

In his discussion of the floras of the land masses south of the equator, Good points out the completeness of change between plant life of Australia and that of Lord Howe (and Norfolk Island, New Caledonia and New Zealand). He erects the hypothesis of independent drift of Australia to its present position and that this may account for the independence of the floras of such places as Australia and Lord Howe.

49. Green, P.S. (1967).—Spermatophytes recorded for Norfolk or Lord Howe Islands. Unpublished 24 pp. foolscap MS in Royal Botanic Gardens Sydney Library, plus 10 pp. of notes by staff botanists.

This compilation lists all spermatophytes recorded by previous authors and gives synonyms. A revised list by Rodd (1971) is more complete.

50. Green, P.S. (1970).—Notes relating to the floras of Norfolk and Lord Howe Islands. I. J. Arnold Arbor. *51*: 204–220.

A series of taxonomic notes on the floras of these two islands.

New combinations of Lord Howe plants: *Sophora howinsula* (W.R.B. Oliver) P.S. Green, *Acronychia simplicifolia* (Endl.) D.J. McGillivray et P.S. Green, *Melicytus novae-zelandiae* (A. Cunn.) P.S. Green. New taxon: *Melicytus novae-zelandiae* (A. Cunn.) P.S. Green ssp. *centurionis* P.S. Green.

51. Hampe, E. (1869).—Species muscorum novas ex Herbario Melbourneano Australiae. Linnaea *36*: 513–526.

There is no mention of Lord Howe Island in this paper.

52. Hampe, E. (1874).—Species muscorum novas ex Herbario Melbourneano Australiae. Linnaea *38*: 661–672.

The following new species from Lord Howe are described: *Brachystelium howeanum* Hpe., *Macromitrium brevisetaceum* Hpe., *Rhodo-bryum leucocanthum* Hpe., *Spiridens muelleri* Hpe., *Euptichium mucronatum* Hpe., *Neckera trichophoroides* Hpe., *Drepano-hypnum praenitens* Hpe.

53. Hemsley, W.B. (1891).—Vegetation of Lord Howe Island. New Zealand J. Sci. (Dunedin) N.S. *1*: 159–161.

A reprint from Nature *43*: 565–566. (April 16th, 1891).

General description of the vegetation with reference to endemic or unusual plants.

54. Hemsley, W.B. (1896).—The flora of Lord Howe Island. Ann. Bot. (London) *38*: 223–284.

Hemsley lists 209 species on the island, gives synonymy and some notes. There is some discussion of the origin of the flora.

55. Hemsley, W.B. (1907a).—No title. Bull. Misc. Inform. (1907): 58.

Description of one new species from Lord Howe Island: *Dysoxylum pachyphyllum* Hemsley.

56. Hemsley, W.B. (1907b).—*Dysoxylum pachyphyllum* Hemsl. Hooker's Icon. Pl. 29: t. 2827.

Illustration of the species with notes.

* Hill, E.S. (1870a).—Lord Howe Island—Official visit by the Water Police Magistrate, and the Director of the Botanic Gardens Sydney; together with a description of the island. Votes and Proceedings of the Legislative Assembly of New South Wales 1870 *1*: 635–654.

This paper is cross-indexed here but is discussed under Anon. (1870b).

57. Hill, E.S. (1870b).—Lord Howe Island, 1869. pp. 31–60 *in* Anon. (1870b).—Lord Howe Island. Official visit by the Water Police Magistrate and the Director of the Botanic Gardens, Sydney. (N.S.W. Government Printer: Sydney).

Hill gives a general description of the island and a useful copy of Notes by R.D. FitzGerald†, surveyor who accompanied the party. This includes a description of an attempted ascent of Mount Gower. Hill concludes with details of island history, agriculture and biology. There is a census of persons and notes on the proposed penal settlement.

58. Krempelhuber, A. von (1880).—Ein neuer Beitrag zur Flechten-Flora Australiens. Verh. K.K. Zool.-Bot. Ges. Wien *30*: 329–342.

This reference was found in Cheel (1906) who referred to no. 6 in Cheel (1903) where the journal is cited as Verh. Zool.-Bot. Ges. Wien *30*. However this name for the journal existed only from volume 68 in 1918, being preceded by Verh. K.K. Zool.-Bot. Ges. Wien.

The journal does not appear to be available in Australia.‡

59. Krempelhuber, A. von (1881).—Lichenes australiani e Baroni de Mueller collectionibus, Doctore Augosto de Kremplehuber enumerati 1880 *in* F. Mueller Fragm. Phyt. Austral. *11*: Suppl. 70–74.

Includes three records from Lord Howe Island.

* "Linnaeus" (1882).—The Island of Lord Howe. The Madeira of the Pacific.

For details see under Clarson (1882).

60. Lucas, A.H.S. (1935).—The marine algae of Lord Howe Island. Proc. Linn. Soc. New South Wales *60*: 194–232.

Lucas mentions 91 species from Lord Howe: Phaeophyceae 21 + 2 undetermined subspecies, Rhodophyceae 46, Chlorophyceae 24.

Sixteen new species are described, all by Lucas except for *Codium lucasii*, viz.: *Enteromorpha howensis*, *Cladophora gowerі*, *Cladophoropsis howensis*, *Codium lucasii* Setchell, *Sargassum howeanum*, *Dictyata simplex*, *Liagora howensis*, *Cyclidium maidenii*, *Sarcocladia rhizophora*, *Gracilaria howensis*, *Laurencia elegans*, *Polysiphonia baxteri*, *Dasya fruticulosa*, *Ceramium setchellii*, and *Amphiroa howensis*.

There are also short accounts on ecology and sources of the marine flora.

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† Although FitzGerald's name is spelt "Fitzgerald" in Hill's report, the upper case "G" is correct according to Serle, P. (1949).—Dictionary of Australian Biography. (Angus and Robertson: Sydney.)

‡ The author would appreciate a photocopy for reference.

61. Macdonald, J.D. (1853).—Remarks on the natural history and capabilities of Lord Howe Island *in* Anon. (1853).—Proposed new penal settlement. Votes and Proceedings of Legislative Council of New South Wales *2*: 727–731.

This is the most important of the early references to the botany of Lord Howe. Maiden (1898) pp. 119–121 gives a largely verbatim transcript and as this is widely available no further details will be given here.

62. Macdonald, J.D. (1872).—Note sur la topographie et l'historie naturelle de l'île de Lord Howe. Arch. de Méd. Navale *17*: 241.

This paper was not available to the author and the relevant issue of the journal does not appear to be held in any Australian library. The reference is quoted from Etheridge (1889b) p. 630. It appears likely that Etheridge may be correct in assuming that "not withstanding the discrepancy in the date, this and the official report are probably one and the same".†

63. Macgillivray, J. (1854).—Letter from John Macgillivray Esq. Naturalist of H.M. Surveying-ship *Herald*, commanded by Capt. Denham, dated Sydney, March 3rd, 1854. Hooker's J. Bot. Kew Gard. Misc. *6*: 353–363.

This letter has been cited in a variety of ways, for example:

Macgillivray: Visit to Lord Howe's Island Kew J. of Bot. *6*: 353 (Oliver 1916).

Macgillivray: Letters from Hooker's New J. of Bot. *6*: 353 (Hemsley 1896, Maiden 1914).

Although primarily a zoologist, Macgillivray makes some useful botanical observations essentially similar to the more detailed observations of Macdonald which are of the same vintage.

64. Maiden, J.H. (1898).—Observations on the vegetation of Lord Howe Island. Proc. Linn. Soc. New South Wales *23*: 112–158.

The title of this paper is misleading; there are few "observations on the vegetation", but Maiden gives a series of notes on the climate, pigs and goats (major feral pests) and an excellent bibliography (pp. 116–122). Plants are listed using the list of Hemsley (1896) as a basis and those which are noted by Hemsley are not repeated by Maiden. Maiden gives brief notes on a number of species. Further lists are timber trees (pp. 147–148), introduced weeds (pp. 148–151), edible introduced fruits (pp. 151–153) vegetables and miscellaneous food-crops (p. 153) and some miscellaneous introduced plants (chiefly economic) (pp. 154–155).

Maiden adds 16 native and 17 introduced species to Hemsley's total of 209. These together with a number of deletions by Maiden give a total of 217 native and 20 introduced species. New taxa described are: *Cupania howeana* Maiden, *Aspidium aculeatum* Sw. var. *moorei* Christ ex Maiden.

65. Maiden, J.H. (1899).—Some further observations on the vegetation of Lord Howe Island. Proc. Linn. Soc. New South Wales *24*: 381–384.

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† The author would appreciate a copy of this paper for reference.

Brief notes on species listed in his earlier paper and some further bibliographic notes. One new taxon is described: *Dendrobium gracilicaule* F. Muell. var. *howeanum* Maiden.

66. Maiden, J.H. (1901).—On one of the so-called honeysuckles of Lord Howe Island. Proc. Linn. Soc. New South Wales *26*: 156–158.

A brief note that *Cupania howeana* Maiden is a later synonym of *Guioa coriacea* Radlk.

67. Maiden, J.H. (1902).—On a new *Cryptocarya* from Lord Howe Island, together with notes on other plants from that island. Proc. Linn. Soc. New South Wales *27*: 347–351.

Description of *Cryptocarya gregsonii* Maiden.

68. Maiden, J.H. (1914).—Further notes on the botany of Lord Howe Island (Fifth Paper). Proc. Linn. Soc. New South Wales *39*: 377–384.

A few more bibliographical notes and extracts from a letter by C. Hedley to Maiden with some useful observations on the flora and vegetation. Lists of species from the summit of Mt Gower and the Admiralty Islets. Miscellaneous notes on some other species. One new species is described: *Plantago hedleyi* Maiden.

69. Maiden, J.H. (1920).—A few notes on the botany of Lord Howe Island (Sixth paper.) Proc. Linn. Soc. New South Wales *45*: 564–566.

Further brief notes on a number of species particularly *Howea* hybrids.

70. Maxwell, G.G. (1928).—Lord Howe Island. Sydney University Sci. J. Michaelmas Term 1928 *11*: 80–89.

Descriptive only, with little useful data on the vegetation or flora.

p. 84: on the slopes of Mt Gower "the ground here and there has been rooted up by wild pigs . . ."

p. 85: Rat plague.

Some of the description is a paraphrase of McCulloch (1921 and 1928).

71. McCulloch, A.R. (1921).—Lord Howe Island—a naturalists' paradise. Austral. Mus. Mag. *1*: 30–47.

A good description of the island.

p. 38: an ascent of Mt Lidgbird is described.

p. 40 *et seq.:* Description of the summit of Mt Gower.

p. 43 *et seq.:* the rat plague (1919) is described.

72. [McCulloch A.R.] (1928).—Lord Howe Island—a naturalist's paradise. Wentworth Magazine *4* (2nd August): 4–6 and 46–47 and *4* (3rd October) 4–6 and 18.

A reprint of McCulloch (1921). The author's name is not given but it is obvious, as the note "Reprinted by the kind permission of Dr. C. Anderson, M.A., D.Sc., Director of the Australian Museum" appears.

73. McMichael, D.F. and Talbot, F.H. (1969).—Conservation of the islands and coral reefs of the Great Barrier Reef system, the islands of the Coral Sea, and Norfolk and Lord Howe Islands. Micronesica *5*: 493–496.

Very brief discussion of the vegetation and flora in terms of conservation.

74. Merrill, E.D. (1947).—A botanical bibliography of the islands of the Pacific. Contr. U.S. Natl. Herb. *30*: 1–404.

Lord Howe Island is listed on pages 344 and 403. All titles mentioned have been included in this bibliography.

75. [Moore, C.] (1869a).—Lord Howe's Island. Gard. Chron. *28*: 968–969.

This paper is signed "C.M., Botanic Gardens Sydney" which obviously refers to Moore, as he was Director of the Botanic Gardens from 1848 to 1896. This observation is reinforced by the reprint as Moore (1869b). The paper has apparently been misquoted in Merrill (1947) as Moore (1869) . . . Gard. Chron. 1869: 98 (sic) and by Hemsley (1869).

The article gives a general description of the flora and vegetation with brief notes on some species.

76. Moore, C. (1869b).—Vegetation of Lord Howe's Island. J. Bot. *7*: 299–304.

A verbatim reprint of Moore (1869a).

77. Moore, C. (1870a).—Sketch of the vegetation of Lord Howe Island. Votes and Proceedings of the Legislative Assembly of New South Wales 1870 *1*: 640–643.

This paper is essentially similar to Moore (1869a), although it includes a list of 105 spermatophytes and 22 ferns. The notes are of a general descriptive nature.

78. Moore, C. (1870b).—Sketch of the vegetation of Lord Howe Island pp. 17–27 *in* Anon. (1870b).—Lord Howe Island Official visit by the Water Police Magistrate and the Director of the Botanic Gardens, Sydney; together with a description of the Island by Edward S. Hill. (N.S.W. Government Printer: Sydney.)

This report is essentially a reprint of Moore (1870a).

79. Moore, C. (1870c).—Sketch of the botany of Lord Howe's Island. Trans. Bot. Soc. Edinburgh *10*: 365–372.

The contents of this paper are similar to the other papers by Moore listed here. There are some very useful observations on the effects of goats and pigs on the vegetation.

80. Moore, C. (1871).—Remarks on the botany of Lord Howe's Island. Trans. Roy. Soc. New South Wales *5*: 29–34.

Although similar to the other papers this has lists of genera and some phytogeographical discussion. Moore states (p. 30) "at least two-thirds of the island . . . was very carefully botanically examined by myself and those who assisted me". But this is highly doubtful, as two-thirds of the island is precipitous mountains and Moore had only three days on the island. Notwithstanding this, the floristic tables are quite useful. (105 genera, 135 species.)

81. Moore, C. and Betche, E. (1893).—Handbook of the Flora of New South Wales. (N.S.W. Government Printer: Sydney).

Appendix 1, pp. 518–521 lists "Lord Howe and Norfolk Island plants, excluded from the descriptive part of the flora of New South Wales". The list has 67 species.

82. Moore, H.E. Jnr (1966).—Palm hunting around the world IV Lord Howe Island. Principes *10*: 13–21.

A semi-popular discussion of the island's four palms and their habitats with a number of excellent photographs.

83. Mueller, F. von (1858–1882).—Fragmenta Phytographiae Australiae *1* (1858–59)—*12* (1878–82).

The entire work contains scattered references to the Lord Howe Island flora but the paper below is the most important.

84. Mueller, F. von (1875).—Index omnium insulae Howeanae plantarum, quas hactenus obtinui, exclusis speciebus certe introductis. Fragm. Phyt. Austral. *9*: 76–78.

A list of 192 species from Lord Howe Island.

85. Mueller, F. von (1886).—Lord Howe's Island and Captain Armstrong. Cumberland Times, August 7th 1886.

Not seen by the author—probably unimportant for botanical information.

86. Müller, J. (1882).—Lich. Beit. No. 405. Flora *65*: 304.

This reference is to the lichen *Sticta poculifera* Müll. from Lord Howe. The full title of the paper is not known to the author but the title above is probably sufficient.

87. Müller, J. (1887).—Revisio lichenum australiensium Krempelhuberi. Flora *70*: 113–118.

Only one direct reference is made to Lord Howe lichens (p. 117) "53. *Sticta quercizans*, a Lord Howe's Island est *Sticta sinuosa* v. *macrophylla* Bab.".

88. Nicholls, M. (no date, ? 1951).—A History of Lord Howe Island (Mercury Press: Hobart) 148 pp.

A popular history of the island which gives sources for most of the information. Botanical information on a number of species is given on pp. 87–95 but some of this is incorrect.

89. Nicholson, E.M. and Douglas, G. (1969).—Draft check list of Pacific oceanic islands. Micronesica *5*: 327–463.

Lord Howe is listed on p. 455 and the vegetation is described using the Fosberg/IBP system [Fosberg, F.R. (1967).—A classification of vegetation for general purposes. pp. 73–120 *in* Peterken, G.F. (1967).—Guide to the checksheet for IBP areas. IBP Handbook No. 4].

90. Oliver, W.R.B. (1916).—Vegetation and flora of Lord Howe Island. Trans. & Proc. New Zealand Inst. *49*: 94–161.

The most recently published treatment of the vegetation and flora. The vegetation is classified into nine formations and sixteen associations. Each is described in terms of structure, floristics and site. There is a little anatomical information on some of the species. The origin of the flora is discussed in detail. A list of indigenous species totals 209. The list is annotated with details of previous published records, distribution, habitat and some data on anatomy. Oliver lists 30 species as introduced. An annotated bibliography is included.

Nine new combinations are made: *Polystichum moorei* (Christ) W.R.B. Oliver, *Asplenium howeanum* (Watts) W.R.B. Oliver, *Ophioglossum vulgatum* L. var. *prantlii* (C. Chr.) W.R.B. Oliver, *Calamagrostis avenacea* (Gmel.) W.R.B. Oliver, *Uncinia filiformis* Boot. var. *debilior* (F. Muell.) W.R.B. Oliver, *Peperomia tetraphyllum* (Forst. f.) W.R.B. Oliver, *Tetragonia strongylocarpa* (Endl.) W.R.B. Oliver, *Nothopanax cissodendron* (C. Moore et F. Muell.) W.R.B. Oliver and *Wedelia uniflora* (Spreng.) W.R.B. Oliver.

Three new taxa described: *Marattia fraxinea* Sm. var. *howeana*, *Sophora tetraptera* J. Mill. var. *howinsula*, and *Coprosma prisca*.

91. Paramonov, S.J. (1958).—Lord Howe Island, a riddle of the Pacific. Pacific Sci. *12*: 82–91.

An excellent introduction to the island with notes on climate, soils and vegetation. The paper is essentially a preamble to Paramonov (1960, 1963) and contains a large bibliography.

92. Paramonov, S.J. (1960).—Lord Howe Island, a riddle of the Pacific, part II. Pacific Sci. *14*: 75–85.

A discussion of the origins of the fauna of Lord Howe. There is no direct botanical information.

93. Paramonov, S.J. (1963).—Lord Howe Island, a riddle of the Pacific, part III. Pacific Sci. *17*: 361–373.

The final paper in the series. Discussion of the origins and affinities of the flora is in this part. The hypotheses advanced are: (a) The sunken land (of which Lord Howe is a remnant) was not connected to Australia after development of *Eucalyptus* and *Acacia* species. (b) Lord Howe was probably never directly connected with Norfolk Island. (c) Lord Howe received its flora from the north (tropical elements) and south (subtropical and temperate elements).

* Phillip, A. (1789).—The Voyage of Governor Phillip to Botany Bay . . .

This has been fully discussed under Anon. (1789).

94. Pickard, J. (1972a).—The geographical place names of Lord Howe Island including a list of maps, charts and aerial photographs (manuscript).

An analysis of changes in place names on maps; included are local names. This paper enables accurate location of most early specimens from Lord Howe.

95. Pickard, J. (1972b).—Vegetation map of Lord Howe Island. (Manuscript).

Descriptive memoir to accompany a vegetation map (scale 1 : 15840, 4 inches to 1 mile).

96. Pickard, J. and Clark, S.S. (in preparation).—Vegetation of Lord Howe Island.

See under Clark and Pickard.

97. Rabone, H.R. (1940).—Lord Howe Island. Its story from its discovery to the year 1888. Roy. Austral. Hist. Soc. J. & Proc. *26*: 113–164.

This is virtually identical with Rabone (1959).

98. Rabone, H.R.R. (1959).—Lord Howe Island. Its discovery and early association 1788 to 1888. (Australis Publication: Sydney) 54 pp. 2nd printing, 1st printing 1940.

A popular history of the island with many verbatim quotes from primary sources. These are well referenced but there is little botanical information.

99. Rechinger, K. (1907).—Plantae novae pacificae. Repert. Spec. Nov. Regni Veg. *4*: 228–233.

Includes *Sida zahlbruckneri* from Lord Howe.

100. Rodd, A.N. (1971).—Check list of Lord Howe Island angiosperms. Unpublished 13 pp. fcap MS in Royal Botanic Gardens, Sydney, Library.

This is the most recent census of the island angiosperm flora. It is annotated for endemic and naturalized species and gives common names. (Total flora 297 species: endemic 57, naturalized 121.)

101. Seeman, B. (1865–73).—Flora Vitiensis. (London) xxxiii + 453 pp.

Includes some records from "Howe's Island".

* Shortland, Lieut. (1789).—The Voyage of Governor Phillip to Botany Bay . . . Also cited as Shortland and Watts.

See under Anon. (1789).

102. Sleumer, H. (1938).—Die malesisch—pacifischen *Xylosma*—Arten. Notizbl. Bot. Gart. Berlin-Dahlem *14*: 288–297.

One new species is described from Lord Howe: *Xylosma maidenii* Sleumer.

103. Sleumer, H. (1967).—Flacourtiaceae. Contr. New South Wales Natl Herb., Flora Ser. *136* Suppl.

Lists *Xylosma ovatum* Benth. from Lord Howe.

104. Smith, L.S. (1957).—*Corokia* A. Cunn.—An addition to the Australian genera of Saxifragaceae. Proc. Roy. Soc. Queensland *69*: 53–55.

A discussion of the genus in eastern Australia. One new combination is made for Lord Howe Island: *Corokia carpodetoides* (F. Muell.) L.S. Smith.

105. Sprague, T.A. (1944).—A new species of *Rapanea* (Myrsinaceae) from Lord Howe Island. Proc. Linn. Soc. London *155*: 288–290.

Description of *Rapanea mccomishii* Sprague.

106. Stephani, F. and Watts, W.W. (1914).—Hepaticae Australas. J. & Proc. Roy. Soc. New South Wales *48*: 94–135.

This paper lists 31 species from Lord Howe and six new species are described by Stephani: *Archilejeunea wattsiana, Cheilojeunea wattsiana, Frullania howeana, Pyenolejeunea wattsiana, Lophocolea howeana, Metzgeria howeana.* Although it is clear that the first five are described from Lord Howe Island, the last, *Metzgeria howeana* is described from "Australia, Mount Wilson and Wyong: Watts legit, 1065". These localities are on the mainland within 150 km of Sydney and it seems strange that Stephani used the specific epithet "howeana" with such localities. A brief search through the hepatic collection in the N.S.W. National Herbarium has failed to locate the specimens but until the collections are properly curated it will be difficult to locate individual collections. Of course, the other possibility is that Stephani simply used the "wrong" specific epithet for a mainland species.

107. Tate, R. (1893).—The geographic relations of the floras of Norfolk and Lord Howe Islands. pp. 205–221 Macleay Memorial Volume (Linnean Society of New South Wales: Sydney).

A discussion of the relationships and origins of the floras with lists of species arranged in phytogeographic affinity. He concludes that Lord Howe is "a companion outlier to Norfolk Island of the New Zealand region".

108. Taylor, M.R.F. (1939).—*Elaeocarpus costatus* M.R.F. Taylor. Bull. Misc. Inform. 1939: 178–179.

The original description of this endemic plant from Lord Howe Island.

109. Thellung, A. (1906).—Die Gattung Lepidium (L.) R. Br. Eine monographische studie. Mitt. Bot. Mus. Univ. Zürich *28*: 1–340.

Description of one new species from Lord Howe: *Lepidium howei-insulae* Thellung (p. 291) (in German).

* Watts, Lieut. (1789).—[Notes on Lord Howe Island] pp. 223–226 *in* Anon. (1789)—The Voyage of Governor Phillip to Botany Bay . . . (John Stockdale: London).

See under Anon. (1789).

110. Watts, W.W. (1912).—The ferns of Lord Howe Island. Proc. Linn. Soc. New South Wales *37*: 395–403.

A descriptive account of the ferns of the island with details of localities.

New taxa described are: *Asplenium bulbiferum* Forst. f. var. *howeanum* Watts, *Polystichum kingii* Watts.

111. Watts, W.W. (1914).—Additional notes on the ferns of Lord Howe Island. Proc. Linn. Soc. New South Wales *39*: 257–262.

Some taxonomic notes on the ferns, with descriptions of two taxa: *Polystichum whiteleggei* Watts, *P. moorei* Christ var. *tenerum* Watts.

112. Watts, W.W. (1915).—Two Lord Howe Island Polypodia. J. & Proc. Roy. Soc. New South Wales *49*: 395–388.

Descriptions of two new species: *Polypodium pulchellum* Watts, *Polypodium howeanum* Watts.

* White, H.J. (1835).—Survey of Lord Howe Island.
See under Anon. (1870a, b).

* Whitelegge, T. (1892).—List of twenty species of mosses collected at Lord Howe Island. Proc. Linn. Soc. New South Wales 7: 277.

See under Anon. (1892).

* Wilkinson, H. (1882a).—No title [A report on the geology of Lord Howe Island and geological map] pp. 1467–1469 *in* Wilson, J.B. (1882a).—Lord Howe Island (Report on present state and future prospects). Votes and Proceedings of the Legislative Assembly of New South Wales 1882 *4*: 1463–1474.

See under Wilson (1882a, b).

* Wilkinson, H. (1882b).—No title [A report on the geology of Lord Howe Island and geological map] pp. 17–22 *in* Wilson, J.B. (1882b).—Report on the present state and future prospects of Lord Howe Island. (N.S.W. Government Printer: Sydney).

See under Wilson (1882b).

113. Wilson, J.B. (1882a).—Lord Howe Island (Report on present state and future prospects). Votes and Proceedings of the Legislative Assembly of New South Wales 1882 *4*: 1463–1474.

This is essentially the same report as that discussed below (Wilson 1882b).

114. Wilson, J.B. (1882b).—Report on the present state and future prospects of Lord Howe Island. (N.S.W. Government Printer: Sydney) Folio 40 pp., 17 photographs and 2 maps.

As noted above this report is essentially identical with Wilson (1882a).

It differs in the following manner:

(a) Printed on different size and quality paper;
(b) Printed in different type faces;
(c) There are no photographs in Wilson 1882a;
(d) The historical introduction is not included in Wilson 1882a.

It appears that Wilson 1882b is simply a different printing of the material which was originally published in the Votes and Proceedings.

The report was written after Wilson "held a special Commission to report on certain official Matters" (p. 9) concerned with the dismissal of the current Resident Magistrate Captain R.R. Armstrong.

The report has a number of subreports as follows:

Anon.—Lord Howe Island. pp. 1–9. A series of historical notes with details of the proposed penal colony. (This section is not included in Wilson 1882a.)

Wilson, J.B.—Report on the state and prospects of Lord Howe Island, pp. 13–17.

A general report with few botanical details.

Wilkinson, H.—No title. pp. 17–22.

A report on the geology of the island with chemical analyses of some rocks and soils. A geological map is appended (scale 1 : 15,840, 4 inches to 1 mile). Listed are names of 28 tree species of which wood was collected.

Conder, W.J.—No title. pp. 23–25.

A brief summary of Conder's surveying activity and of land tenure. Appended are details of latitude and longitude.

Moore, C.—No title. p. 27.

A covering note for the next report.

Duff, J.—No title. pp. 28–37.

This report is discussed under Duff (1882b) above.

Morton, A.—No title. pp. 39–40.

A brief report on the fauna of the island.

115. Zahlbruckner, Z. (1896).—Lichenes Mooreani. Ann. K.K. Naturhist. Hofmus. *11*: 187–196.

There are 12 taxa listed for Lord Howe Island, including two new species.

New species described: *Sticta mooreana* A. Zahlbr., *Parmelia stramineonitens* A. Zahlbr.

ACKNOWLEDGEMENTS

The author is indebted to the Lord Howe Island Board for financial assistance during the field work on Lord Howe Island, and to Miss Judy Hufton who checked a number of obscure titles and deciphered the author's cryptic notes. Dr R.D. Hoogland, Research School of Biological Sciences, Australian National University, made a number of useful suggestions and kindly checked his personal files for suitable references.

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Contr. NSW
Natl Herbarium
4 (1966-73)

~~Entwisle~~	~~2/4/94~~	~~J. Jeanes~~	~~11/5/05~~
~~DBF~~	~~18/5/95~~	NIMAL ~~KARUNAJEEWA~~	10/4/08
~~DBF~~	~~24/5/96~~	~~J.Birch~~	~~19/4/12~~